Amateur Radio

Volume 89
Number 2 ▶ 2021
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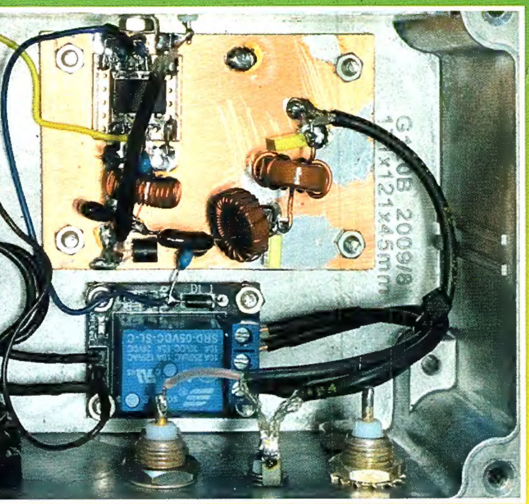

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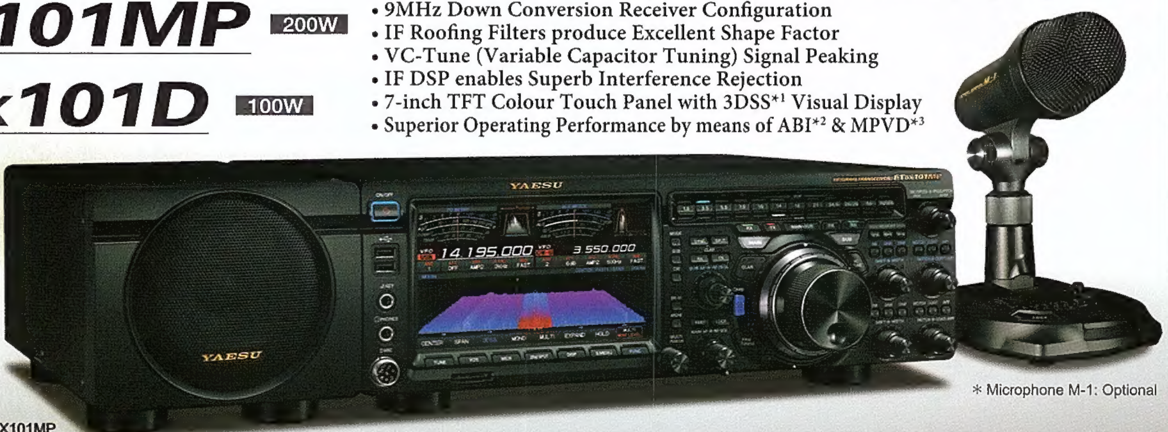

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∗ Photo shows the FTDX101MP

[*1] 3DSS: 3-Dimensional Spectrum Stream [*2] ABI: Active Band Indicator [*3] MPVD: Multi-Purpose VFO Outer Dial

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This month's cover:
Don't miss our lead feature on licensing - starting Page 6. Meanwhile, on the air, the application known as the Weak Signal Propagation Reporter (WSPR) has found favour with many amateurs who thrive with experimentation; WSPR is widely used on many amateur bands. The shooshing cherub is a public domain image, while the other photo shows part of an internal view of Dale VK1DSH's "WSPR-E" transmitter based on an Arduino board driving a Class-E RF output stage.

Contributions to Amateur Radio

Amateur Radio is a forum for WIA members' amateur radio experiments, experiences, opinions and news. Manuscripts with drawings and/or photos are welcome and will be considered for publication. Articles attached to email are especially welcome. The WIA cannot be responsible for loss or damage to any material. Information on house style is available from the Editor.

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A radiocommunication service for the purpose of self-training, intercommunication and technical investigation carried out by amateurs; that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest.

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Editorial

Roger Harrison VK2ZRH

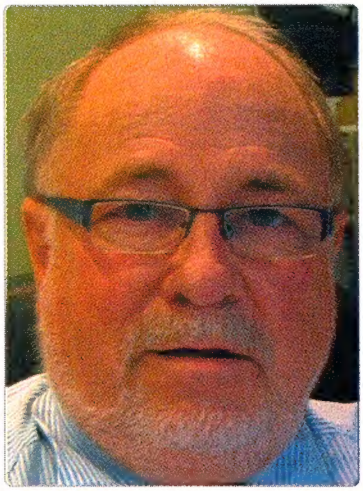
It's elections for the WIA will be held this year, I am faintly reminded of a two-year course that I was compelled to attend during my time as a student at RMIT, back in the late 1960s – titled History of Ideas. I recall being introduced to the metaphysical rants of Niccolo Machiavelli, the 16th century diplomat, philosopher and writer. We hapless students were also exposed to the theses of Buddha, Marx and John Maynard Keynes, amongst many others. In technical classes, we were exposed to the theorems and hypotheses of Kirchoff, Packard, and Doppler, et al. A well-rounded education.

Machiavelli has been much quoted, but I have found this to be presently apt: *"There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things"*.

At this stage, I have to announce that I will be stepping back from my role in editing this journal as I proceed with preparations to move to VK4. I have departed my previous day job and am embarking on a new direction with my family there and cannot for now spare the time. The Publications Committee is seeking someone to fulfil this role in the meantime.

This following item would generally be destined for the news pages, but, as you will see, I have a personal connection and thought it apposite to include it here.

Jaycar founder dies



Gary Johnston, the founder of iconic electronics retailer, Jaycar, died on 10th March after a short illness.

In 1981, Gary bought a small Sydney shop located in a courtyard off a laneway behind Dixon Street in Sydney's Chinatown precinct. Clearly, a prominent and iconic location! Although named John Carr Pty Ltd, it was known around the trade as Jaycar and owned at the time by an accountant.

The business was advertised 'for sale' in a Sydney newspaper. At the time, Gary Johnston was employed at Dick Smith Electronics in a marketing role. Dick saw the advertisement, cut it out and put it on Gary's desk (a challenge!). Gary enquired and subsequently bought the business as "a going concern". Read "barely going".

Gary rented a shop on nearby Sussex Street – a busy thoroughfare – and moved the Jaycar business there. He formalised ownership of

Continued on page 50

Board comment

Greg Kelly VK2GPK

Hello, this is Greg, WIA President,

ACMA Licence Class Consultation: The Australian Communications and Media Authority (ACMA) recently issued consultation document which details 3 licensing options concerning the future of Amateur Radio in Australia seeking submissions from the Radio Amateur Service. The significance of this consultation is that the ACMA's preferred option (Option C) is to transition to a "Class Licence" instead of the current apparatus licence – *this option effectively deregulates the radio amateur service!*

A consultation working group of 11 volunteers working collaboratively has produced an initial detailed analysis of the implications of a class licence, now published on our website[1]. The working group will finalise a comprehensive and representative WIA submission to this consultation to the ACMA. This submission will be enhanced using feedback from the WIA secure poll - which hadn't yet closed as I write this. I wish to sincerely thank the WIA consultation working group for their efforts and wise counsel on this important submission.

It is important to understand the financial context of this ACMA consultation. The ACMA is subject to year on year budget cuts – euphemistically called "efficiency dividends – which means that every year the ACMA have less resources. This budget impact is apparent in the progressive loss of engineering and scientific skills and also administrative resources. The end result inevitably is the ACMA is seeking ways to reduce costs, which underlies the basis for their preferred Option C for deregulation.

The WIA acknowledges that Option A at this time does not meet the objectives of the ACMA. The WIA also notes that the ACMA states that they want to "preserve the current operational utility for licensees". The WIA asserts that this objective has not been met within the ACMA's current proposals and that the Option C proposal, as presented, fails any sort of "no disadvantage" test. And the prospect of a "free" licence goes nowhere near offsetting the negative impacts.

An Option D: However, the WIA firmly believes that there are potential opportunities for either Apparatus or Class Licence types - or more likely a hybrid thereof - to deliver mutually beneficial outcomes for both the Australian amateur and amateur-satellite services and the ACMA. Of course such an option must "preserve the current operational utility for licensees". Hence, the WIA submission will explore the scenarios of what would effectively become an Option D by addressing the shortfalls of the ACMA proposed Option C. It is important to NOT dismiss outright a Class Licence option which retains essential regulatory protection but allows scope for self-regulation. There are working examples of class licences for amateur radio in other jurisdictions which have not been detrimental. For instance, our near neighbour across the ditch, namely New Zealand.

There are also examples in Australia of self-regulation that are useful to examine, such as how the relationship between Air Services Australia, Recreational Aircraft Australia and Australian Sport Rotorcraft Association. Here Air Services does the overarching legal and international regulation, treaties, etc. The accredited "self regulation" entities ASRA and RAA are delegated all technical standards, testing, pilot licensing, aircraft accreditation and registrations, and accident investigations. The precedent set in the aviation context[2] is in an environment where the risk of injury or death is much higher than the Amateur Service. I personally believe that a Class Licence is ultimately inevitable in the mid-term, even if not in the near term, and it is worth considering different scenarios and the opportunities that may ensue of co-regulation and/or self-regulation. The implementation of a hybrid arrangement where there is an appropriate split of regulation between the ACMA and the Amateur Service is **clearly non-trivial.** Frameworks would need to be in place to support full self-regulation, benefit radio amateurs and ensure a low cost, not-for-profit solution.

WIA 2021 Election: If everything has gone to plan, your mailed issue of the magazine should include your voting material as an insert under the direction of the WIA Returning Officer. If you have elected to receive only the digital copy of

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[1] https://www.wia.org.au/newsevents/news/2021/20210310-1/index.php

[2] My thanks to John Dalton and Aidan Mountford for bringing the aviation precedent to my attention.

Continued on page 4

Board comment

Continued from page 3

the magazine, this material will be posted to you directly. Note that due to concerns about postal delays, the time period to return your votes has now been extended past the already printed date on the voting forms to April 28. Refer to separate MemNet advice for details.

It is pleasing to see that we have a well contested election this year with **8 candidates** for **4 vacant director positions on the board**. As a nationwide organisation, a wider spread of candidates from all state jurisdictions would be desirable for overall membership representation- but that is entirely up to those who nominate.

In Conclusion: When I first nominated for the board I was given some sage advice by the then WIA President which can be summarised as *"you have no idea of how tough a gig you are in for"*. That was in early 2017 and that advice has proven very true. Despite being a director of my own company since 1997 and holding very senior executive prior positions in the corporate world such as Chief Manager of Research & Development for a major bank, IT Development Manager for International Business for one of the largest Telcos, leading IT and IT compliance projects of up to 350 people and budgets of over $50Million plus being a director of a community radio station – I initially underestimated the range, scope of challenges and the learning curve faced particularly in the first year. For me, it has been a great learning experience, rewarding sometimes, thankless at other times and certainly not fun. Taking on the president role 18 months ago, has added to the learning experience especially in direct interactions with the regulator, the ACMA. Even though it is a tough gig as a director, I have renominated as I believe that continuity of corporate knowledge is vital to avoid repeating history. There are 3 current directors that have re-nominated and are 2021 candidates, please give careful consideration to the aspect of retaining at least some corporate knowledge when you make your voting selection. And please make the effort to vote[3] – the WIA is a democratic organisation – so exercise your right as a financial member to vote for those candidates you think best represent you on the board for the ongoing stewardship of the WIA.

Until next time, this is Greg VK2GPK

---

[3] The last WIA election had approximately 50% voting response rate.

WIA news

Two marks of an era

Two quiet, poignant events marked the passing of an era in the worlds of electronics, computing and communications – the death of Gerald J Burke (aka Jerry), author of the Numerical Electromagnetic Code (NEC) antenna simulation software, and the death of Lou Ottens, developer of the compact cassette.

From its early days, NEC quickly established itself as the go-to method of simulating antenna performance and continues to be one of the more widely-used antenna modelling codes in existence.

A legacy in software

The legacy left by Jerry Burke is embedded in the now open-source NEC2 code, widely used in many free (e.g. 4NEC2) and other low-cost antenna modelling applications. NEC2 was developed to NEC4.2 and, more recently, a complete rewrite of the code, now dubbed NEC5.

Even though he was semi-retired, Burke wished to complete the NEC5 project before retiring 'permanently'. He died on 14 February 2021 only a few short months after NEC5 was released.

While working at the US-backed Lawrence Livermore National Laboratories over the late 1970s through the early 1980s, Burke and development partner Andrew J Poggio built the code that was subsequently released in open-source. See: *www.researchgate.net/publication/224751959_The_Numerical_Electromagnetics_Code_NEC_-_a_brief_history*

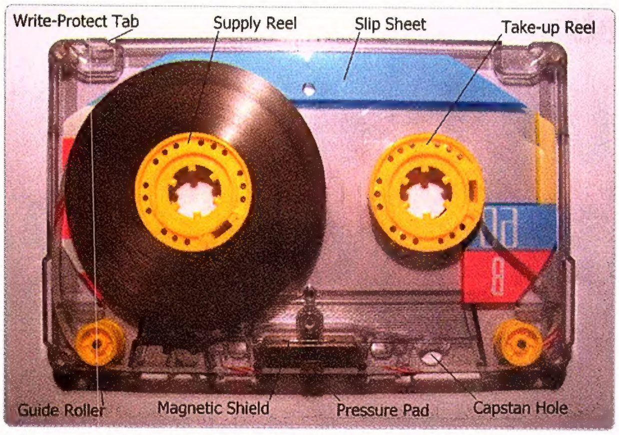
Ubiquity in your pocket

Explaining what drove him to invent the compact cassette, Lou Ottens said, "I got annoyed with the clunky, user-unfriendly reel-to-reel system. It's that simple."

Ottens died on 7 March, aged 94, at his home in Duizel in Brabant, DutchNews.nl reported.

He studied to be an engineer and began working for Philips in 1952. In 1960, he became head of Philips' newly-introduced product development department. Within a year, Ottens and his team had developed the first portable tape recorder, of which over a million were sold. Two years later he revolutionised the old reel-to-reel tape system by inventing the compact cassette tape.

Ottens deduced that the new tape carrier had to be small enough to fit into his jacket pocket.



High-end cassette decks became a must-have item in 'component' hi-fi equipment. This Nakamichi Dragon is an exemplar of the genre.

To 'prove' the concept, he had a wooden model made to determine the ideal size.

In 1963 the first plastic encased compact cassette was presented at an electronics fair carrying the slogan "smaller than a pack of cigarettes!" As is the way of the electronics world, they were quickly copied by the Japanese, but in different formats!

Cunningly, Ottens managed to make a deal with Sony to use the mechanism patented by Philips to introduce a standard compact cassette which was then rolled out world-wide. Over 100 billion were sold across the globe. Later, Ottens went on to develop the compact disc (CD), which again became a Sony-Philips standard, selling over 200 billion units.

Retiring in 1986, he was often asked if he was proud of his inventions that allowed millions of people to have access to music. In answering, he always stressed that invention of both the compact cassette and the CD were team efforts.

Sony's invention of the Walkman cassette player was a source of regret for Ottens, because it was not a Philips development; the Walkman was the ideal application for the cassette, he said.

In the 1970s, the cassette was adapted and re-purposed by personal computer hobbyists for data storage. The Computer Users' Tape Standard (CUTS), operating at either 300 or 1200 baud was widely adopted and made its way into many low-cost PC systems.

The photo above is a Memorex cassette showing the components while the image below shows the Nakimichi Dragon high-end cassette deck, an exemplar of the 'component' hi-fi genre (Wikipedia).

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Does the ACMA propose to dump amateur radio

Get out of our hair – Class licensing for all?

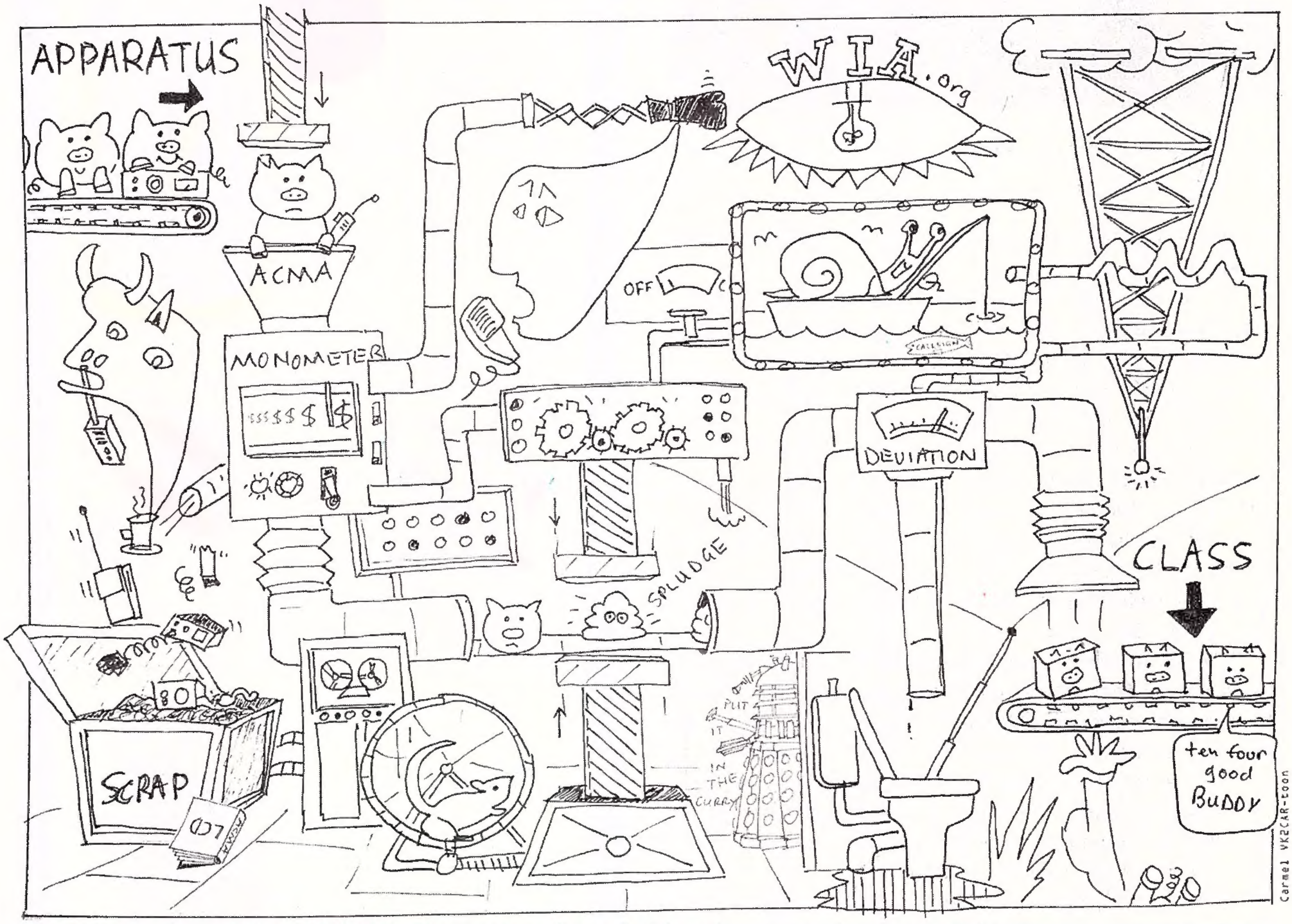


Illustration by Carmel Morris VK2CAR. Observant readers will pick up the visual references to Pablo Picasso, amongst others.

In February this year, the Australian Communications and Media Authority (ACMA) commenced a "Review of non-assigned amateur and outpost regulatory arrangements – consultation 01/2021", with the intent of streamlining the administration of the amateur and amateur satellite services in Australia.

The ACMA stated that it believed the current amateur service licensing arrangements are complex, prescriptive and costly for licensees, and for the ACMA to administer. Under the Australian Government's deregulation agenda, the ACMA has been set the tasks of simplifying amateur service licensing and removing the cost burden both to the amateur radio service and, specifically, to the ACMA.

The WIA has long held the view that the amateur service is overburdened with prescriptive regulation, and has suggested regulatory simplification and more self-management for the amateur service in various submissions to the ACMA over more than two decades.

The Review consultation document proposed three alternatives on the above panel.

It was clear from the start that each option held significant implications for the amateur service, and a highly considered response from the WIA was necessary, so the WIA Board referred the issue to the WIA's Spectrum Strategy Committee, which comprises a group of amateurs with expertise and experience in the field of radiocommunications regulation. The Committee has advised the Board on many occasions, and prepared WIA

Option A was to: *keep the existing apparatus licensing arrangements with the same licence conditions.* This option would see no change in the amateur service, but it would not meet the key objectives of administrative cost savings, and was clearly not within the agenda of the ACMA.

Option B was to: *simplify the current licensing arrangements and licence conditions by amending the Radiocommunications Licence Conditions (Amateur Licence) Determination 2015 (Amateur LCD).* This option may have had the potential to simplify administrative functions, and to save money, but without any detail on how this might be achieved it was impossible to know the implications, or to recommend it.

Option C was to: *transition to class licensing arrangements for amateur stations operating on common frequencies (non-assigned amateur stations). The operation of amateur beacon and repeater stations (assigned amateur stations) would continue to be authorised under apparatus licensing arrangements, possibly with new arrangements for frequency coordination and assignment.* This option was a serious attempt to simplify the administration of the amateur service, and was clearly the preferred option from ACMA's point of view.

submissions to the ACMA for many years, going back to about 2012.

The WIA has long-held the policy that future amateur licensing ***"should not be reduced or downgraded from the current principles embodied in Apparatus licensing",*** and reassuringly, the ACMA stated that it proposed to: ***"preserve the current operational utility for licensees"*** throughout this consultation process.

Where the rubber hits the road

This does not presume that the only possible outcome is an Apparatus licence for each amateur, but it does mean that the values and utility that Apparatus licensing brings to the amateur service must not be lost. However, the more the Spectrum Strategy Committee unpacked the three Options, the more the 'no disadvantage' test looked problematic, and the more apparent it was that Australian radio amateurs could be severely disadvantaged by the changes proposed in Option C. Inconveniently, Option C was the ACMA's clear preference, and the one that would deliver most simplification and therefore maximum administrative savings and, as a sweetener to the amateur community, the removal of licence fees.

Analysing Option C is where the rubber hit the road for the Spectrum Strategy Committee.

The most obvious problem is that, in moving to a Class licence, the amateur service would risk losing the protection against interference embodied in current Apparatus licensing.

When an amateur lodges an official interference report, the ACMA is required to consider taking investigative action against the source of interference. Recent practice seems to show that interference complaints are assessed on their merits, covering a number of factors – which includes the quality of the evidence presented and the potential for harm. The ACMA adopts a "graduated and strategic risk-based approach to compliance and enforcement" and will take "regulatory action commensurate with the seriousness of the breach and the level of harm" (*www.acma.gov.au/compliance-and-enforcement-policy*). All this means is that, currently, under apparatus licensing, the ACMA may or may not respond to interference complaints from radio amateurs, depending on the individual circumstances.

The ACMA consultation paper contains a statement that, under the Class licence proposal, amateur stations would be operating on a "no interference, no protection" basis, and must not "cause interference to other devices and services". This sounds very much like we would lose what limited protection we now have.

The "no protection" from interference statement also raises concerns about the ongoing willingness of the ACMA to remove unauthorised transmitters from amateur spectrum, even where the amateur service is allocated primary or exclusive rights.

Not only that, the statement in the consultation paper that amateurs must not interfere with other 'Devices' is of particular concern. Especially so, as a 'Device' could be any piece of electronic equipment, such as audio-video equipment or any of the myriad of electronic devices used in our modern society. Although the fault may lie in the susceptibility of the 'Device', the amateur station could still be shut-down with no recourse.

Currently, these types of issues have been quietly negotiated between the amateur and the neighbour experiencing the interference. Often the amateur will place filters and suppression devices on Devices to mitigate the susceptibility issue and, under Apparatus licensing, the amateur currently has support under the Radiocommunications Act (1992) in relation to susceptibility. This is not the case under Class licensing.

How could this type of change possibly pass any sort of 'no disadvantage' test, and perhaps even more importantly, how would it relate to the Primary Service status for the amateur service embodied in the International Telecommunications Union (ITU) regulations?

More issues and failing the test

The interference issue is big, but it's not the only one. The Spectrum Strategy Committee identified a number of other issues, such as:

- it is not clear how amateurs will be expected to comply with the ARPANSA Radiation limits under the Class licence;
- the removal of individual amateur licences from the Radiocommunications Register of Licences;
- the removal of an individual licence document that identifies the individual operator, and its effect on CEPT arrangements for amateurs travelling overseas;
- and various concerns around transmitter spurious emissions standards, translations of technical requirements (particularly impacting the MF and LF bands), and the handling of secondary spectrum that could further restrict the amateur and amateur-satellite services.

Balanced against these issues were some significant advantages, including:

- streamlining of licensing process and reduced delays in a person acquiring a licence;
- a licence potentially for life;
- a new model for repeater and beacon licensing with reduced delays and costs;
- general simplification and removal of unnecessarily prescriptive regulations;
- scope for greater self-management and self-regulation of the amateur service;
- and the big one in some people's minds – no licence fees.

As the consultation period was only about eight weeks, and radio amateurs needed to have timely guidance for their own submissions, time was very short. The Spectrum Strategy Committee went to work quickly (virtually, over a weekend) on a discussion document, holding a series of Zoom meetings and numerous group emails.

It quickly became apparent that, although Option C held obvious advantages for the ACMA, and some for the amateur service, and it was clearly the preferred option of the ACMA, it failed any kind of 'no disadvantage' test.

There were a range of views in the committee, including a view that we should include an Option D, or a modified Option C, that would attempt to capitalise on the advantages of a Class licence and overcome the problems identified, but time was short and the prevailing view was that we should respond to the questions the ACMA had asked, as anything else could easily be discounted as being out-of-scope.

Of risks and benefits

So, Option C as it stands has too many disadvantages, Option B is short on detail and probably wouldn't achieve the level of administrative savings anyway, leaving only Option A – no change – as the viable option, and this is what the Spectrum Strategy Committee recommended to the WIA Board.

However, aware of the ACMA's agenda, the potential to improve administration of the amateur service, and the fact that a Class-like licence has been in operation in the UK and New Zealand for a number of years without apparent issue, the Spectrum Strategy Committee also recommended the WIA and the ACMA work together to overcome the problems associated with Option C.

In the interest of full consultation, the WIA Board decided to seek the views of members and other amateurs and released an on-line poll, choosing between the three options, together with the Spectrum Strategy Committee's recommendation for Option A, pending further engagement with the ACMA on the feasibility of making a Class licence work.

Where now?

At the time of writing, the poll is still open, and we do not know the result. It's important say that the Spectrum Strategy Committee is not opposed to a Class licence per se, as long as it's done in such a way that the amateur service is not disadvantaged. There are clearly advantages in a Class-Licence in its potential to meet the key objective of simplifying the administration of the amateur service, the elimination of licence fees, and the potential for greater self-regulation.

Another option not canvassed so far is that, because the ACMA has the delegation to grant Apparatus licences for up to 20 years, each existing Apparatus licence could be issued for 20 years, with a one-time payment. This would save administration costs and callsigns could be simply re-registered every five years to take account of people who have lost interest in the hobby, or fallen silent key.

I am told this change would be relatively easy to apply with the ACMA's current licensing system as it would just need a revision of the current LCD.

The WIA eagerly awaits the outcome of the online poll and the Spectrum Strategy Committee will be preparing the WIA's final submission for Board approval based on the poll results.

This is not the last gasp; rather, just a step along the way.

Changes in the flexibility of ACMA licensing arrangements are already due to commence mid-year following recent amendments to the Radiocommunications Act 1992.

While preparing this article, an ACMA Update announced further "reforms that will modernise the legislative framework for spectrum management" and allow the ACMA to "update the Radiocommunications Act 1992".

Further action may come sooner than we all think. Watch this space.

The members of the Spectrum Strategy Committee include: Brian VK3MI, Cameron VK2RA, Dale VK1DSH, Grant VK5GR, Justin VK7TW, Noel VK3NH, Peter VK3MV, Phil VK2ASD, Roger VK2ZRH.

A personal view of the ACMA proposals

Note: this was emailed to 'the WIA' just on the magazine's deadline, clearly intended for the President and Board. – Editor.

Folks,

I write to add my (hopefully constructive) two cents worth to the discussion over the changes to the amateur licence system proposed by the ACMA.

I have read the documents and followed most of the discussion, and I have to confess that the result is to leave me somewhat confused. Nor, I suspect, am I alone; much of the discussion seems to me to be between people of good intention, unfortunately talking at cross-purposes.

After some reflection, I have come to the conclusion that much, if not most, of that confusion arises from the fact that the ACMA documents do not include a clear statement of the purpose for which an amateur licence is issued. Indeed, one could be forgiven for reaching the conclusion that the amateur service is an historical accident, something of an elderly relative who must be humoured out of respect, but gently prevented from doing anything embarrassing.

Consider, by contrast, the following statement from Rick Campbell KK7B: "Most radio amateurs think they have earned a license to transmit. That is false: anyone can transmit.

Radio Amateurs have earned a license to modify, design, build, and operate their own transmitting equipment and antennas. That is unique in the radio services. You have a license to experiment on the air."

Rick's full title is:
Richard L. Campbell PhD
Life Fellow IEEE
Amateur Extra License KK7B
Professor of Electrical and Computer Engineering
Portland State University
Portland, Oregon, USA.

But, he is probably better known to most amateurs as one of the authors of Experimental Methods in RF Design, an ARRL publication, as well as for many designs and articles over many years. Regardless of his background (or, perhaps, because of it) I have yet to find a better summary of the amateur service than his.

The obvious implication of KK7B's view is that the amateur service is not some adjunct to the real world of radiocommunications, but a fundamental and unique component, central to any spectrum planning.

This view has support from the present situation of international bands allocated to the service; amateur radio is the experimental division of the total radiocommunications sector. It is relatively easy to argue further that the amateur community has earned its place at the table, not just by our history, but by the present contribution it makes; foremost among any listing of that contribution must come people, ideas and, above all, enthusiasm.

The overlap between the amateur community and both research and industry is broad and deep; curtail or limit the amateur's ability to, as Rick puts it, experiment on air, and the whole industry suffers.

Now I see no reason why some such set of words could not be inserted at the head of any proposed licence document, clearly stating the reasons for which the licence is issued. If that were done, I suspect most of the confusion would disappear; the resulting document would gain a coherent structure, where the statement of purpose is logically followed by statements of the conditions and restrictions attendant on the licence.

Yes, there would be discussion, some of it perhaps vigorous, over those conditions, but it would be difficult to impose anything which nullifies the stated purpose in issuing the licence. Indeed, I suspect that the exact form of the enabling document, whether it be class licence or apparatus, or some as yet unseen hybrid, would matter far less, provided the intended purpose was preserved.

It does appear that the discussion is moving broadly in favour of some meld between options A and C (A-C perhaps?).

Rather than leave it to the bureaucracy to produce this, could not the amateur community at least produce a draft, a straw-man, as the US describes it, along the lines I am suggesting? If such a form of words could achieve some broad consensus, it would seem to me to be difficult to replace it with something less acceptable, at least in broad outline.

Nor, it would seem to me, should our position be entirely that of supplicant. If the ACMA could be so persuaded, the amateur community could be seen as a pool of expertise, willing and able to support the ACMA in such areas as interference investigation and anomalous propagation. I know of several cases where this has happened informally; could not some mechanism be found to regularize such work? Any such quid pro quo would seem to me worth exploring.

Well, that is the sum of my thoughts. Naturally, I am available if I can assist further in any way, although I fear that my abilities to do so are rather limited; I would much rather leave to you and your committee the task of finding a way forward.

In that task, you have both my full support and my best wishes.

Yours sincerely
C.J. (Chris) Pitcher VK5YCP

Operate within the band plans: *http://www.wia.org.au/members/bandplans/about/*

Bridging the TeraHertz gap

Practical communications at 30 THz

Andrew Anderson VK3CV, WQ1S

The electromagnetic spectrum is vast. 'From DC to daylight' is a commonly used phrase. But the spectrum extends even further – beyond visible light to the realm of X-rays and gamma rays. Amateurs can play up there untrammelled by laws or regulations. An exciting new frontier!

Introduction

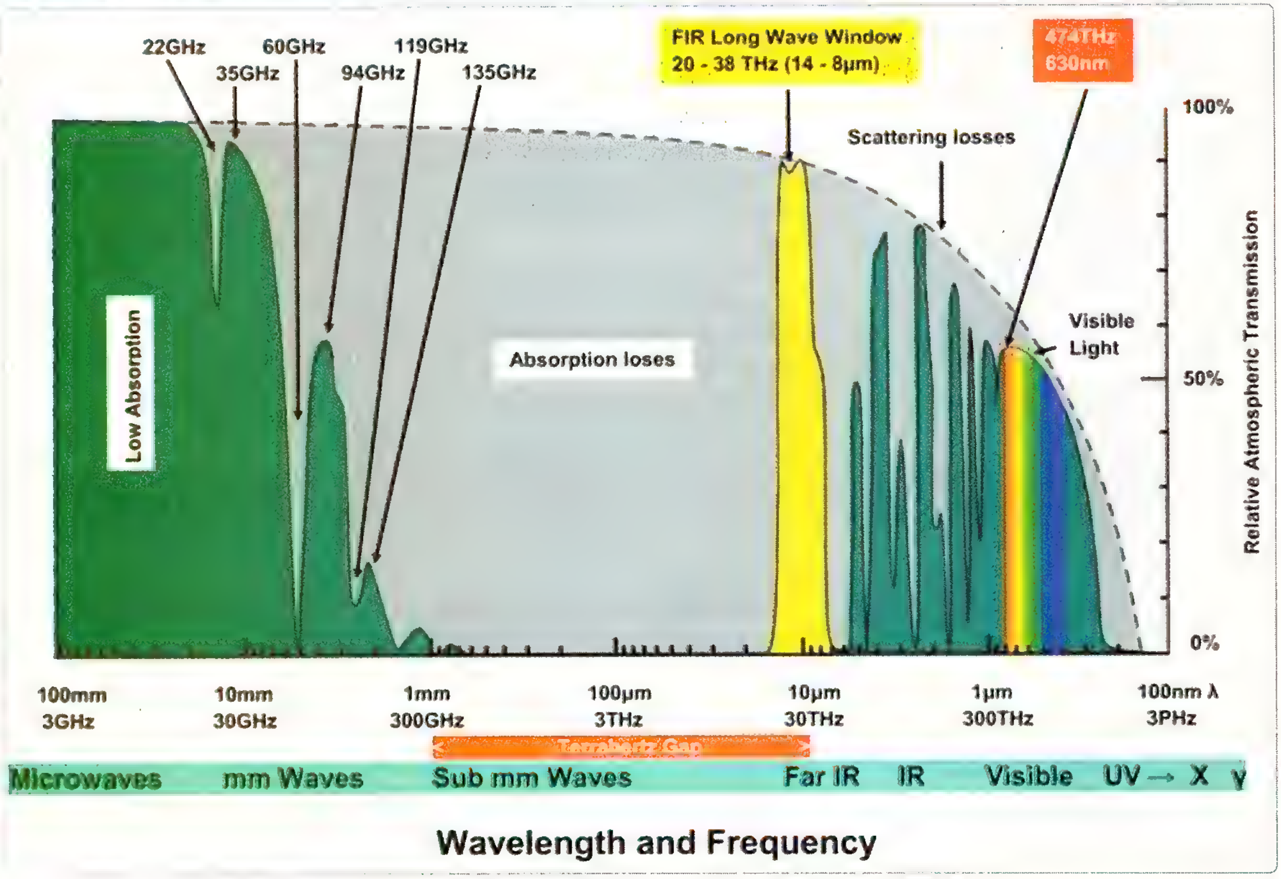
In the amateur radio domain, we just call our section of the spectrum RF (Radio Frequency). That, to us, means somewhere between a few kilohertz up to around 300 Gigahertz, or maybe a bit higher still. Above RF, we usually consider the spectrum as optical – but there is a little used gap that has remained previously unexploited in a communications sense - the THz gap. Amateurs are generally allowed to experiment above 300 GHz as there are no hard and fast regulations in many countries; so, there is a huge amount of spectrum to be explored.

Background

As some of you would know, especially those who have experimented on the higher millimetre-wave bands, the gases in our atmosphere (including water vapour) have a dramatic effect on propagation losses in the high GHz range and it all gets dramatically worse as you go even higher in frequency. There are, however, atmospheric low-loss 'windows' that are best illustrated by referring to Figure 1.

I apologize in advance to those of you who use the LF, MF, HF, VHF and UHF bands as your domain.

Figure 1: Atmospheric losses across the spectrum, from 3 GHz to beyond visible light. Note the Far Infrared (FIR) window highlighted in yellow, where atmospheric losses are comparatively low.



Your spectrum of choice didn't even make it onto this spectrum graph; it's obviously all there, just below where we begin this discussion.

Looking at Figure 1, starting from the left at 3 GHz (microwaves) with 100 mm wavelength, the atmospheric losses are reasonably low and generation and reception of RF signals are well understood. At these wavelengths, it's relatively simple to implement practical transmitters and receivers with easily obtainable electronic devices. Also, note here that Figure 1 refers to added atmospheric losses; these are in addition to the normal inverse-square-law path losses associated with any type of electromagnetic communications system.

As we move to the right along the spectrum in Figure 1, we start to see large dips in relative transmission, primarily because of absorption losses. The black dashed line across the top of the graph separates absorption losses from scattering losses.

The absorption losses exhibit narrow dips, with the first at 22 GHz, then 60 GHz etc, and many more until the losses become huge above 300 GHz. We're now in the "TeraHertz Gap", a term used to describe an area of spectrum from 1 mm – 10 μm (micrometers), or 300 GHz – 30 THz, depending on which reference you use.

The Terahertz Gap terminology was coined for two reasons:

- It's difficult to use this area for any purpose as there are huge added atmospheric path losses that make the distances achievable very small, and
- It's technically very difficult to obtain electronic devices that will generate and detect RF signals at these frequencies.

At the very top end of the Terahertz Gap, between 20 and 38 THz, there is a low-loss atmospheric window (shown in Figure 1 as yellow) that has relatively low losses. This is an area ripe for exploration that sits right at the boundary of what classical science considers the radio/optical boundary. The corresponding wavelength is 14 to 8 μm. For the sake of simplicity, we'll now term this area **the 10 μm or 30 THz band**. However, we still need to figure out some way to generate and receive signals at 30 THz. That's coming soon.

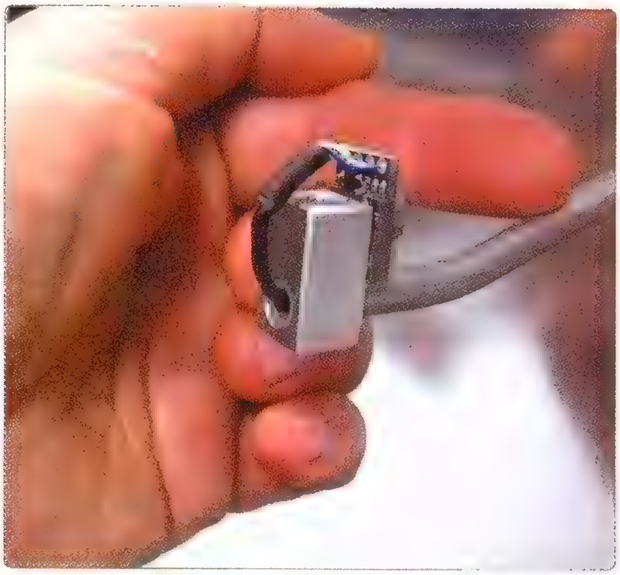


Figure 2. A hand used as a THz signal source.

We've still got some background to cover, as the techniques used have little to do with conventional transmitters and receivers as ordinarily known in amateur radio circles.

As you can see from Figure 1, the 30 THz band sits above the upper mm-wave bands (>300 GHz) but well below the familiar optical bands around 474 THz (630 nm, shown in red). Note also that Figure 1 is an approximation of what happens to losses at a given altitude and relative humidity. The losses shown can deviate significantly in practice depending on the current atmospheric conditions and the barometric pressure.

In optical terms, the 30 THz band sits right at the bottom of the far infra-red (FIR) range; the area is also called the long-wave window. Energy in this band is perceived with our skin as heat, and is relatively safe at the levels we are exposed to from natural sources such as the Sun. Our bodies also radiate this wavelength of energy as does any other physical matter that is above a temperature of absolute zero (-273° C).

This thermal radiation we perceive as heat is actually electromagnetic radiation at around 30 THz, You've been experiencing 30 THz QRN your whole life and didn't even know it! You've also been generating 30 THz band signals. Voilà!, we don't even need any equipment to generate or receive 30 THz test signals as our body has them already built right in. A warm hand makes a great low-level signal generator and carefully bringing the same hand near a 30 THz transmitter will give an indication that it is radiating.

Thermal radiation is the emission of electromagnetic waves from all matter that has a temperature greater than absolute zero. Thermal radiation is the conversion of thermal energy into electromagnetic energy and vice

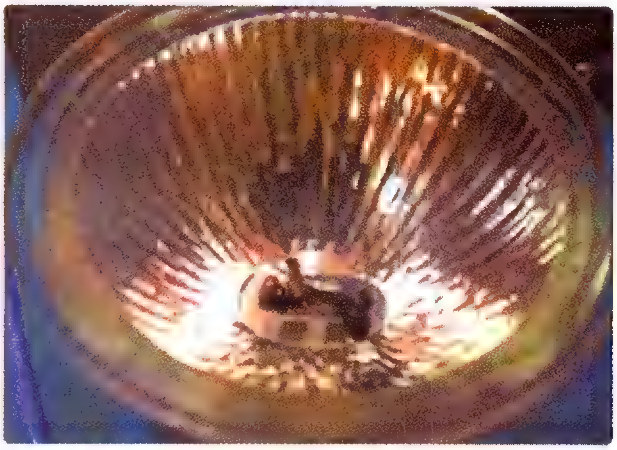


Figure 3. An exposed filament from a 12 V downlight will transmit a THz signal.

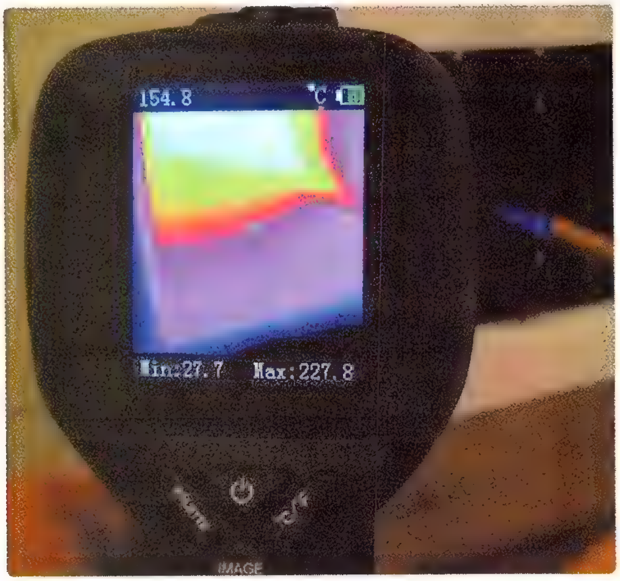


Figure 4. A heated Metal Plate 'transmitter'.

versa. It is the kinetic energy of random movements of atoms and molecules in matter.

In physics, thermal radiation is often referred to as "Black Body Radiation"; that was a term first used during very early scientific experiments in this area as it was thought that black bodies are near perfect radiators and absorbers of thermal radiation. This is not actually the case.

Our own skin has quite high emissivity. I'm not going to go any further into the physics, maths and details of thermal radiation here, but for those who are interested, there are many great references on the internet: use a search term such as "black body radiation", or "thermal radiation".

Pioneer scientists such as Planck, Stefan, Boltzmann, Wien, Stewart, Kirchhoff, and others contributed to the understanding and analysis of black body radiation. The maths is at times complex and can make your head hurt!

All we need to understand about the physics is that the hotter the object, then the greater the amount of thermal radiation. The other important thing to know is that a significant amount of the thermal energy radiated by a hot black body is located in the 30 THz band. Pioneering work in the understanding of thermal radiation led to part of the foundation of quantum mechanics.

Transmitting equipment

So, now onto some practical matters. The transmitter we're using is a black body source. I've experimented with several, as follows:

- my body (Figure 2)
- an exposed filament from a low-voltage downlight (Figure 3. Note: glass is a severe attenuator at 30 THz; hence, no glass can be allowed in the path!)

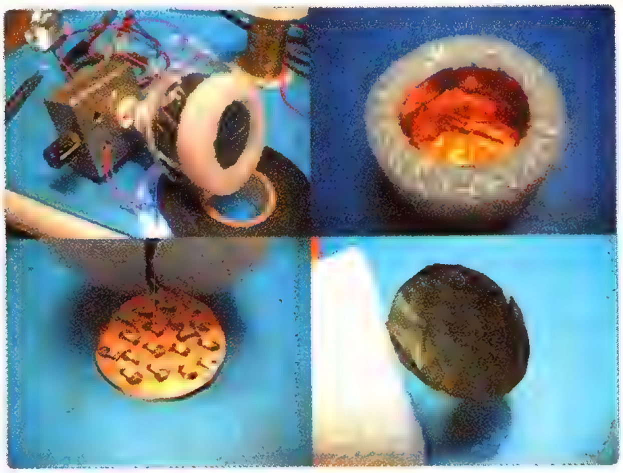


Figure 5. A resistor-heated metal plate THz transmitter.

- a piece of aluminium heated with a propane flame (Figure 4)
- a homebrew heated copper plate with insulation to minimize air cooling, and a 30 THz clear transmission window – clear plastic cling wrap! (Figure 5)
- the Sun and a heliograph modulator (Figure 6 QRO! Be careful, the Sun can transmit 1 kW/m² at mid-latitudes).

The THz band signal from the black body source is then passed through some form of on/off modulator to allow Morse code transmission of information. The heliograph modulator used is simply a reflector that works at the frequency of interest. A normal glass mirror is not suitable as the glass severely attenuates the THz signals. A polished aluminium plate works very nicely and is modulated using the "Armstrong" method.

To be blunt, the transmitter technology shares more similarities with a spark gap transmitter than with a modern solid-state device. The transmitter spectrum is wide and the energy generated is incoherent (more whoosh than whistle).

Receiver equipment

The receiver employed is a little more modern and sophisticated than the comparatively crude transmitter, although its principle of operation goes way back in history. The heart of the receiver is a thermopile sensor made by a company called Melexis. The datasheet is online, here: www.melexis.com/en/documents/documentation/datasheets/datasheet-mlx90614

A thermopile converts heat energy directly into electrical energy. The MLX90614 is intended for use as a non-contact thermometer. It works by measuring the heating effect from thermal radiation absorbed by the thermopile sensor element.

The internal thermopile sensor has a bandpass filter window made of a material that passes only wavelengths between 8 – 14 μm, corresponding to a frequency range of 38 to 20 THz.

Figure 6. A hand-operated heliograph reflector can 'modulate' a THz source (e.g. the Sun).

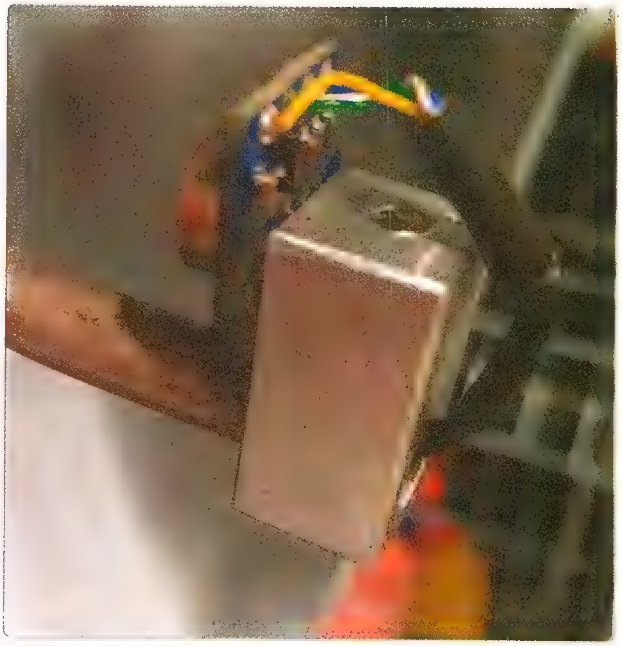


Figure 7. My THz sensor (receiver) mounting that I used with a dish (see Figure 9).

The receiver sensor is mounted at the focal point of a parabolic reflector (see Figure 7), can sense temperature differences as small as 20 millikelvin (mK, or 0.02 K) and has a built-in compensation system to cancel out the device's ambient temperature. The main limitation of the sensor is that its response time is slow. It will only respond to changes in signal level at about half-second intervals when operating at its best sensitivity. This means that, for Morse transmission, the keying speed has to be kept very slow at only a few words per minute.

The Melexis sensor has an I2C interface fed to a PIC processor that has specially written code and a small amount of digital signal processing (DSP) on-board to take the stream of raw data readings from the sensor and provide some useful outputs to you.

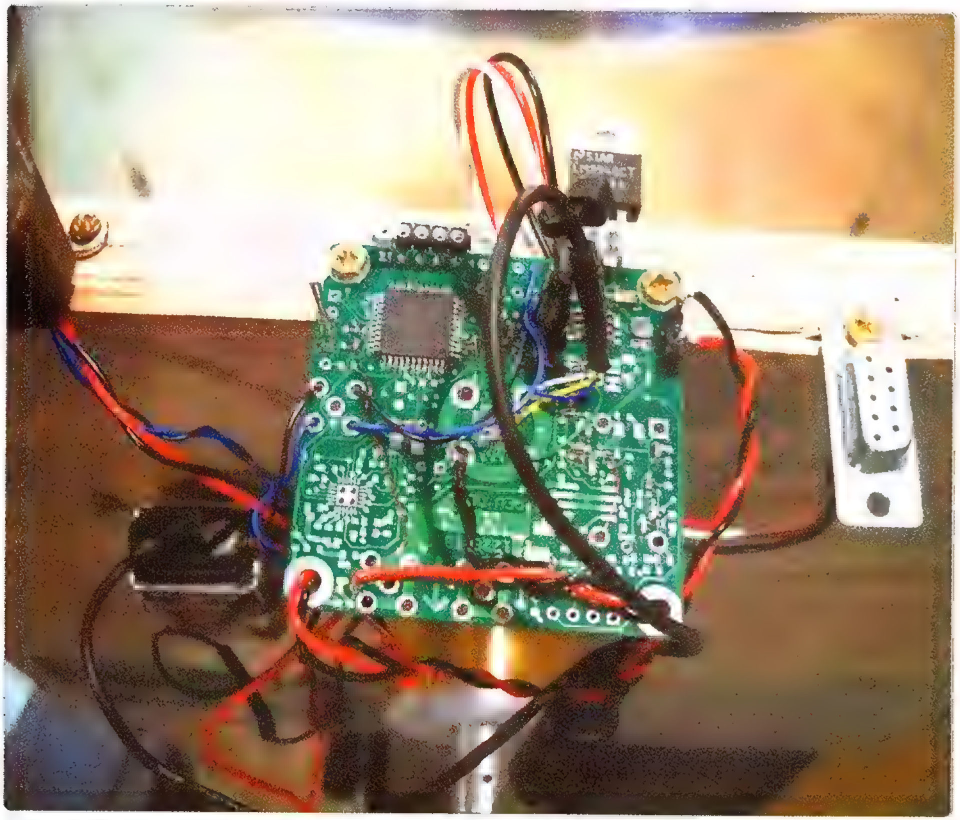


Figure 8. Underside view of the printed circuit board (PCB).

The board used – see Figure 8 –is a heavily-modified VK3CV 122 GHz transverter board with:

- an audio tone output for the demodulator
- an analogue received signal strength indicator (RSSI) meter
- a serial RS232 port to output diagnostics
- a status LED.

A switch is also fitted to select either demodulated audio or tone-based RSSI that is great for peaking the antenna. I may consider laying out a purpose-designed printed circuit board for the project if sufficient interest emerges. The whole project is a work in progress and things are changing by the day.

The parabolic reflector I've used is a 600 mm diameter model from Edmund Optics (Figure 9). On the 10 μm band it has very questionable surface accuracy, but I found that it does have significant gain in practice. All the parts of the system are mounted on a piece of plywood that is then attached to an adjustable tripod.

Experimental results

In November 2020, Karl VK3LN and I made a two-way contact over a 60 metre distance and reported 5x5 signals each way. This contact is believed to be the first ever in this band anywhere in the world.

The result suggests we should be able to achieve much greater distances. We're already exploring more sensitive receiver technology using more advanced sensors.

See the VK3CV_WQ1S YouTube channel for a video made during testing.

Many thanks to Dr Andrew Tirkel who gave valuable guidance during the development of the project and thanks again to Karl VK3LN for his assistance with field operations.

It's time to QSY to 10 μm!

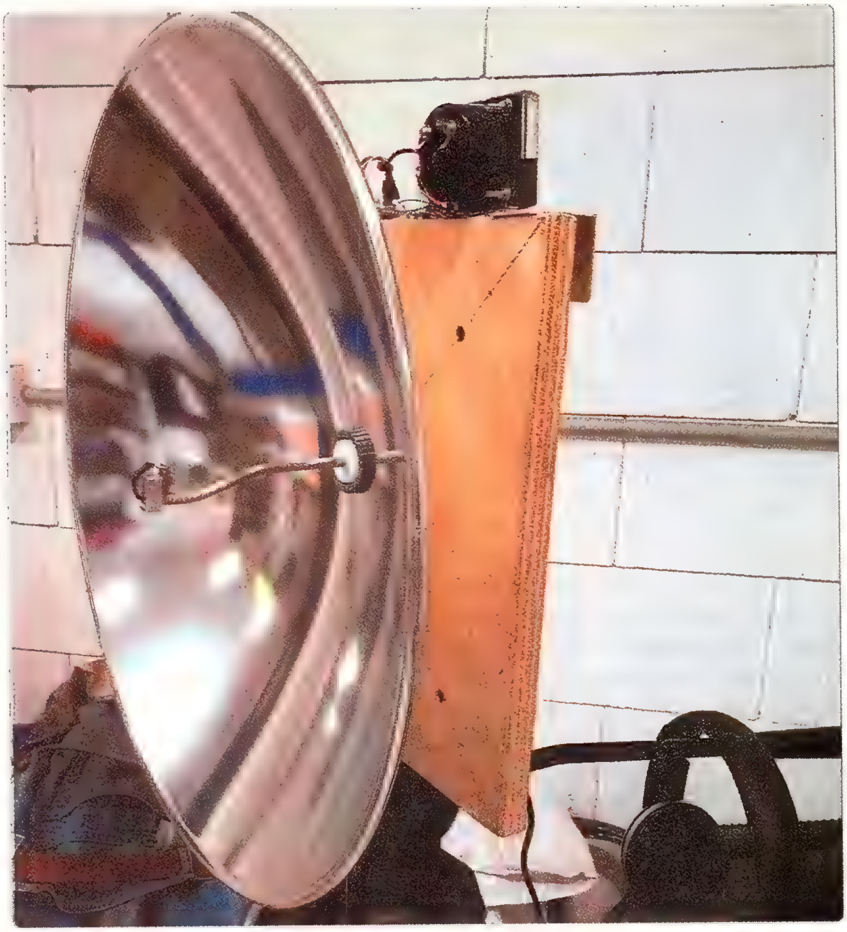


Figure 9: The [illegible] system.

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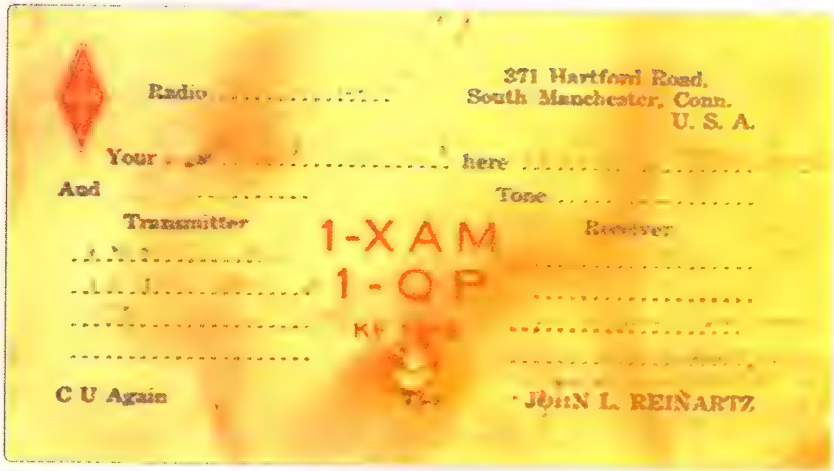
Collection of historic QSLs continues growing

Fred Swainston VK3DAC/VK4FE - Historic QSL Manager



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Radio ....

Your .... here ....

And .... Tone ....

Transmitter 1-XAM Receiver

1-OP

KH

C U Again

JOHN L. REINARTZ

Photo 1: The QSL of famous US amateur John Reinartz 1XAM; one of the rarest in the collection.

The Historic QSL Bureau has been in operation at the WIA Head Office in Melbourne for over 15 years. The collection is maintained and continues to grow owing to the family and friends of SK colleagues (amateurs and shortwave listeners) who donate QSL cards from their personal collections.

The collection of historic QSLs is the second largest in the world and houses some of the world's rarest QSL cards.

It was established largely as a as a result of the legacy of Ken Matchett (SK VK3TL) who, along with his partner, founded, took care of and maintained the collection.

Millions of QSLs

Currently, the collection houses an estimated two million cards. The Historic QSL Bureau links-in with the WIA Historical and Archives Committee that curates a library of radio memorabilia.

The world's largest collection of QSLs is 'DokuFunk' in Vienna, Austria. The WIA maintains contact with Wolf Harranth OE1WHC, who is the manager of the Vienna collection that includes domestic and commercial QSLs and other historic radio memorabilia.

The WIA's collection has been developed in two phases. Initially, the cards were stored in callsign order. The collection is now curated into specific collections and the base card data electronically stored on spreadsheets.

There is an extensive pre-WWII collection running through to current times. There are specialist collections relating to islands, US states, special events etc.

Research

The Historic QSL collection is used for research purposes, where we are able to provide assistance for family history searches, individual call sign history, contributions to research for books, and so on. A recent request was made by a lecturer in graphic design looking at historical design changes between the 1940s, 50s and 60s.

The collection can be accessed by arrangement of a mutually agreed date and time through the WIA Office. Copies of any cards of interest are made and provided, as required. Also visit the WIA website, at: *www.wia.org.au/members/qsl/qsl_collection/*

Photo 2: Individual collections of historic QSLs up to 1970 are housed in this cabinet at WIA Head Office in Melbourne.

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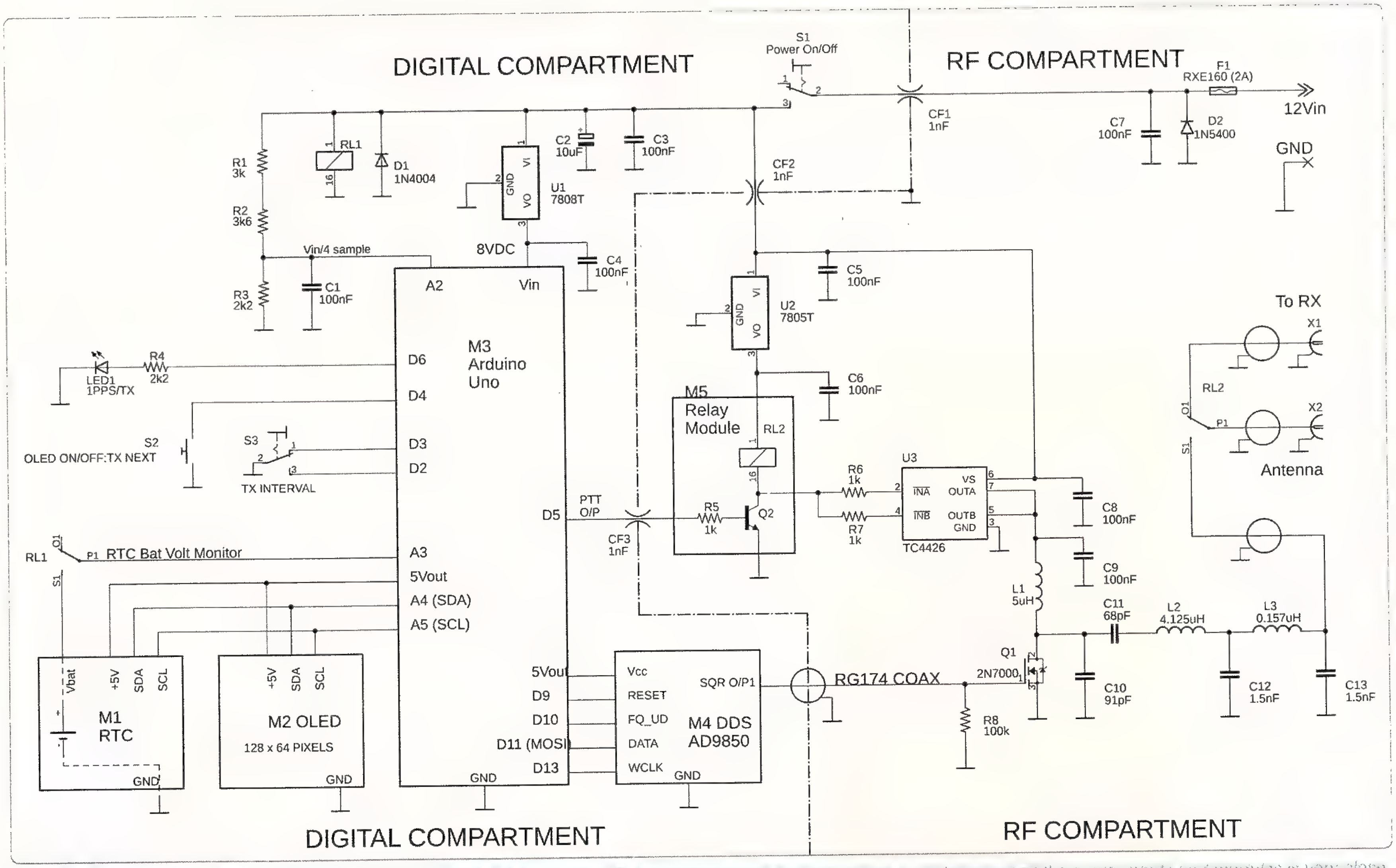


Figure 2. Circuit diagram of my 10 MHz version of the WSPR-1 transmitter. The construction of the transmitter and placement of the components and modules is very close to that shown here in the circuit diagram.

A WSPR-*E* rig

An Arduino-controlled WSPR transmitter with a Class-*E* output stage

Dale Hughes VK1DSH

Joe Taylor K1JT, has had a long and illustrious career; in company with Russell Hulse, the pair of them won the 1993 Nobel Prize for Physics commemorating the 1974 discovery of the binary pulsar. Among other awards, Joe also received the *ITU Gold Medal* during the World Radio Conference 2012 (WRC-12) in recognition of his outstanding contribution to research in the field of radiocommunication. Joe is also an active amateur.

Most amateurs would know him for his creation of the weak signal (WSJT) modes he has pioneered through his knowledge of signal coding and processing, in particular, the application known as the Weak Signal Propagation Reporter (WSPR) that is widely used on many amateur bands.

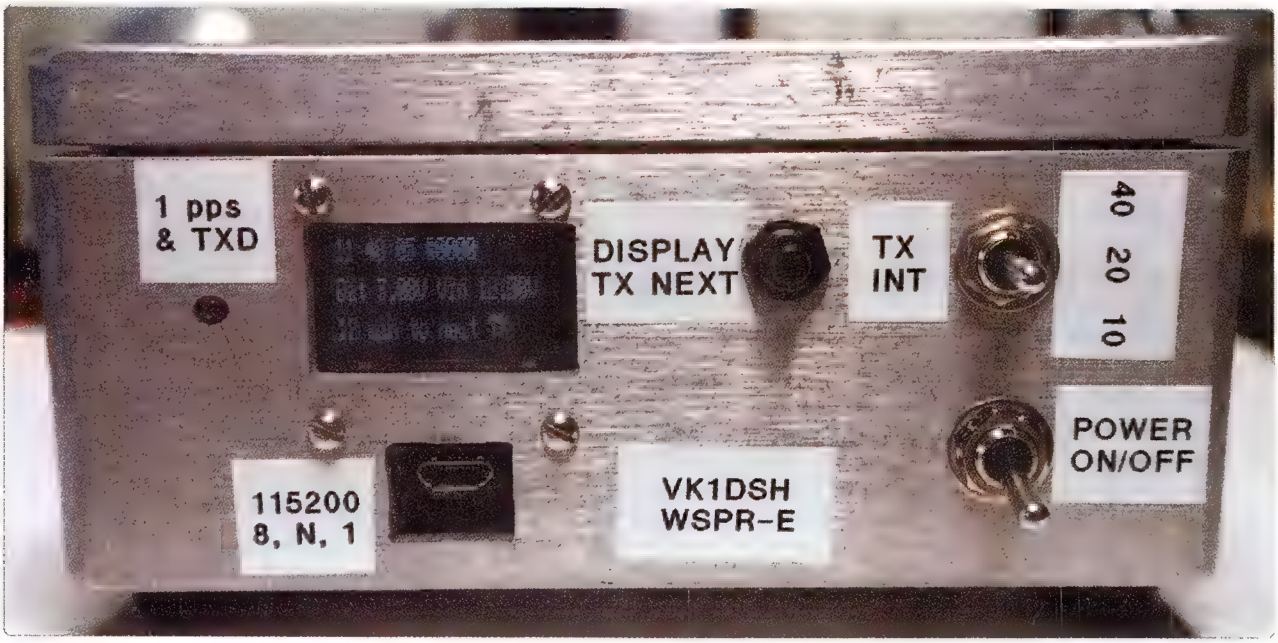
WSPR employs a very clever coding system and strong forward error correction that allows the reception of signals well below the noise floor in the bandwidth of a voice channel (2.3-3 kHz). Typically, WSPR will correctly decode signals with a -30 dB signal-to-noise ratio (SNR) in a 2.4 kHz channel, a remarkable achievement.

This article describes a low-power transmitter using an Arduino microcontroller board to drive an RF output amplifier with a 1 Watt output. The transmitter is based on a design published by Anthony Le Cren F4GOH/KB1GOH, in the August 2020 edition of QST. It includes some modifications of mine designed to improve its performance and to provide some other features that make it easier to use. The important differences are:

- use of a 1 W Class-E RF transmit amplifier, and
- modifications to the software to improve the frequency stability of the WSPR transmission.

The Arduino sketch 'running the show' allows you to select three pre-programmed transmission intervals, or to transmit a WSPR packet on demand. The transmitter operates on the 10 MHz amateur band, but can be easily modified to operate on other HF bands, though the 2N7000 may not work particularly well on bands above

Figure 1. Front view of my WSPR-E transmitter, which I housed in a standard diecast box. The OLED display shows the time, number of WSPR packets transmitted since switch-on, the RTC back-up battery voltage, the main supply voltage and the number of minutes to the next scheduled transmission. You can initiate a transmission manually by pressing the DISPLAY/TX NEXT button, in which case a WSPR packet will be sent on the next even minute.



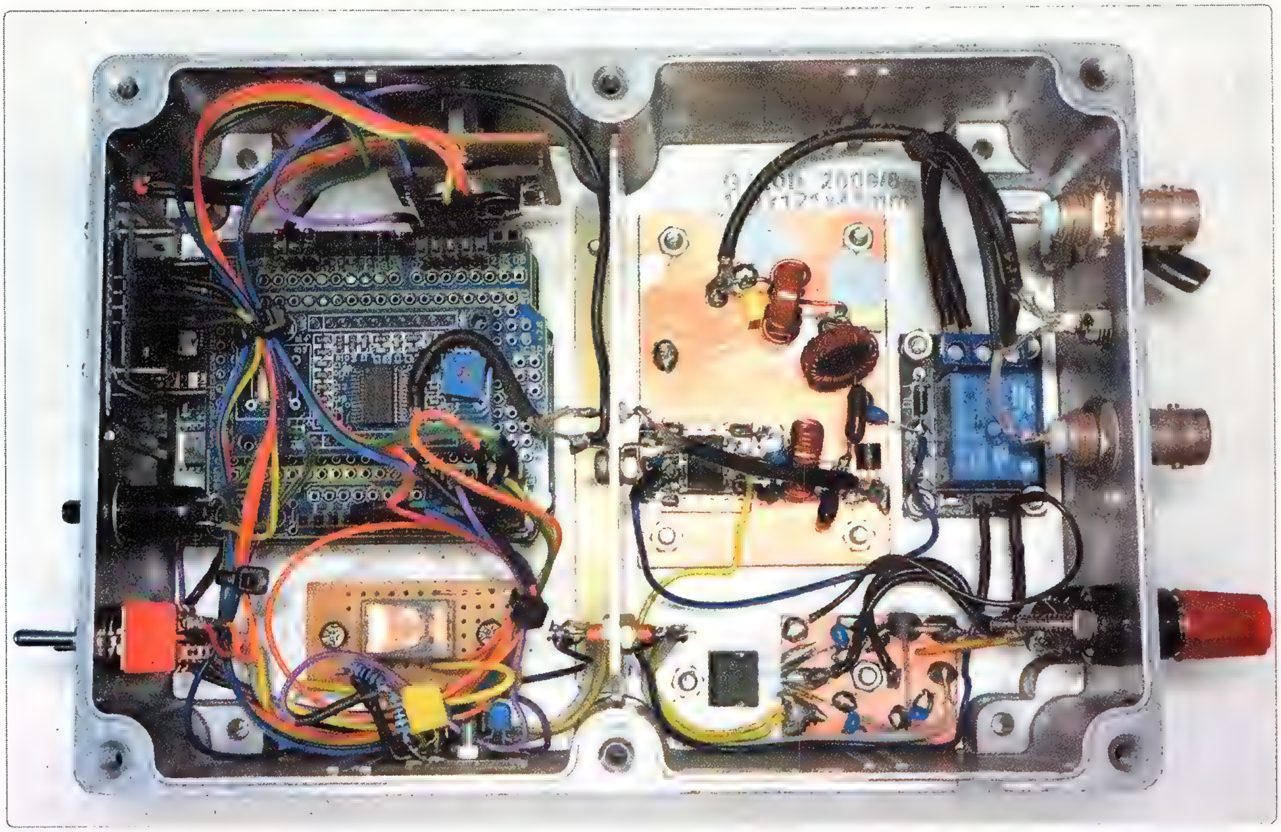


Figure 3. Internal view of the WSPR-E transmitter. The digital compartment is on the left and the RF compartment is on the right. An aluminium screen divides the two compartments, control and power lines pass through the screen via feed-through capacitors, while the 10 MHz RF output from the DDS module uses a small Teflon feed-through pin between two shorts lengths of RG-174 50 Ohm coaxial cable. The Class-E amplifier, built using 'dead-bug' style construction, is mounted on a small piece of copper-clad circuit board material.

twenty metres. Figures 1 and 3 show the external and internal views of my WSPR-*E* transmitter.

General description

The schematic diagram of the WSPR-*E* transmitter, shown in Figure 2, comprises several readily available and inexpensive modules, plus a homemade transmitter board.

The signal source uses a module containing an Analog Devices AD9850 Direct Digital Synthesiser (DDS) chip. The DDS module I used has the model number *HC-SR08* that is available from a number of on-line vendors.

The Real Time Clock module (RTC) uses the Dallas DS3232 RTC chip; my version uses the module made by *Freetronics* that is battery-backed. The128 by 64 pixel Organic Light Emitting Diode (OLED) display that shows transmitter status is also available from a variety of vendors.

Switching of the antenna between the WSPR transmitter and an associated receiver is done using a low-cost SPDT relay module (RL2, Jaycar *XC-4419*); while probably not intended to work at 10 MHz, it performs quite well. Similar or identical relay modules are available from a number of vendors at low cost. All of these devices are controlled by an *Arduino Uno* module.

As already stated, a significant difference between this design and that of Le Cren is the use of a Class-E transmitter output stage. Through a slightly more complex circuit, Class-E operation offers very high efficiency and predictable operation.

The output transistor operates as an on/off switch and the load network shapes the voltage and current waveforms to prevent simultaneous high voltage and high current in the transistor; that arrangement minimises power dissipation, especially during switching transitions. (See the paper by *Nathan Sokal* WA1HQC, for details).

There are several web-based calculators that you can use to determine the amplifier component values rather than grinding through the equations yourself; see the Class-E amplifier calculators by *VK1SV* and *VK2ZAY* for more details.

The 1 Watt power amplifier stage consists of a *2N7000 FET* (Q1), output matching components L1, L2, C10 and C11, and a low-pass filter using L3, C12 and C13. See Table 1 for details of the inductors L1, L2 and L3.

The low-pass filter ensures that the amplifier output complies with our licence conditions; measurements I made with a spectrum analyser show that the 2nd harmonic is approximately 50 dB below the carrier and higher order outputs are even lower.

Directly driving the FET gate with the DDS square wave output is not quite ideal because it does not drive the FET hard enough to achieve the highest efficiency, but the simplicity of the direct connection is appealing and the amplifier does generate the required output power with reasonable efficiency.

The only adjustment required for the transmitter is to adjust the DDS output square-wave symmetry; observe the square-wave output on an oscilloscope and adjust the potentiometer on the DDS module for a 50% duty cycle. I have also tested the amplifier on the 7 MHz band with very good results.

The DC power input to the Class-E output stage is controlled by a *TC4426* (or similar) Dual High-Speed Power MOSFET Driver (U3). Note that this version uses the inverting driver. If desired, you can use the non-inverting TC4427 version with its input connected directly to the PTT output pin (Arduino D5) instead of to Q2's collector.

These devices are usually used to drive the gates of power FETS, but they are also useful for switching power on and off to a load by acting as low-side switches. The input is at logic voltage levels and the output can be 12 V at several amps (depending on the device chosen). In this case, digital output pin (D5) of the Arduino acts as a Press-To-Transmit (PTT) line that switches on the PA stage when transmission of a WSPR packet is required.

The reason for switching the power to the PA stage is because of the modifications I made to the software to improve frequency stability. The original version of the software switched the DDS output ON only when a WSPR packet was transmitted; that resulted in the DDS output drifting slightly for the first few seconds of the packet. My version of the software leaves the DDS running continuously, but shifts the DDS to an out-of-band frequency and switches off the PA stage when not transmitting. This improves the frequency stability significantly and no drift is apparent in any WSPR packets.

Another feature is the measurement of the RTC backup battery voltage that is useful because the RTC backup battery will go flat over time and it is convenient to know when to replace it without having to undo the lid of the transmitter. However, I found that the input resistance of the Arduino analog input falls to just a few thousand Ohms when the microcontroller is not powered; because that quickly discharges the RTC battery, I connected the battery to the Arduino only when power is applied to the transmitter. Relay RL1 performs this function and the battery is connected to the analog input that has a very high input resistance when the Arduino is powered.

You can select the interval between transmissions of WSPR packets by using switch S3, a centre-off toggle switch. The default settings are 10, 20 and 40 minutes between packets, though the times can be easily changed in the Arduino sketch. You can initiate a packet at any time by pressing the DISPLAY/TX NEXT push-button switch (S2), either once or twice, depending on the OLED display state.

I noted that the *OLED* display had faded slightly over the first few months of transmitter operation. My subsequent investigations indicated that OLED displays have a relatively short lifetime. My solution was to turn the display OFF after a few minutes and then turn it back ON when you press the DISPLAY/TX NEXT button so you can see the current status of the transmitter. This should significantly increase the life of the OLED display.

With the display OFF, you can check operation of the transmitter by noting the state of the 1-PPS/TXD LED (LED1): when the WSPR-*E* transmitter is idle (between packets), the LED flashes briefly every second; when a WSPR packet is being transmitted, the LED blinks in synchronism with the WSPR symbols.

As shown in Figure 3, the transmitter construction splits the components into two parts, with separate compartments for the digital and RF sections. I did this so that the transmitter output would not interfere with the operation of the microcontroller and, more importantly, RF noise from the digital components would be less easily coupled to the associated HF receiver.

I provided additional protection by using feed-through capacitors on the control and power lines between the sections. To link the various RF connections, I used miniature coaxial cable (RG-174) in a further effort to reduce potential RF interference problems.

Software and customisation

The software (an Arduino sketch) is straight forward and you can easily modify all the operating parameters. For ease of software customisation or modification, I placed all the user variables at the beginning of the Arduino sketch, with comments and instructions as necessary.

The only slightly difficult aspect of the software is generating the contents of the WSPR packet that is stored as sequence of bytes representing the individual symbols that make up the WSPR packet. Each WSPR symbol can be one of four different frequencies separated by 1.4648 Hz so the Arduino sketch includes a structure containing the 162 symbols of information in each WSPR packet. For example, the symbol sequence for VK1DSH at QF44 with a 30 dBm transmitter is shown in Panel 1:

Panel 1:
Symbol sequence for VK1DSH at QF44 with a 30 dBm transmitter.

```
int wsprSymb[] = {3, 1, 2, 2, 0, 0, 2, 0, 1, 0, 0, 2, 3, 3, 1, 0, 2, 0, 3, 2, 0, 1, 0, 1, 3, 1, 1, 0, 0, 0,
2, 0, 0, 0, 3, 2, 0, 1, 2, 3, 2, 2, 0, 0,2, 2, 3, 2, 3, 3, 2, 0, 3, 3, 2, 3, 2, 0, 2, 1,
3, 0, 3, 0, 2, 0, 2, 3, 1, 0, 3, 2, 1, 0, 1, 2, 3, 0, 2, 3, 2, 2, 3, 0, 3, 1, 0, 2, 2, 3,
3, 2, 3, 2, 1, 2, 0, 2, 3, 0, 0, 0, 0, 2, 3, 0, 2, 1, 0, 2, 3, 1, 1, 0, 1, 3, 2, 2, 3, 1,
2, 3, 0, 0, 0, 3, 3, 1, 2, 2, 2, 0, 2, 3, 0, 1, 2, 2, 3, 3, 2, 0, 2, 2, 0, 2, 2, 1, 1, 2,
1, 2, 3, 1, 2, 2, 0, 1, 1, 2, 0, 2};
```

Note: this sequence is unique to each station as it contains the station callsign, Maidenhead locator and transmitter power in dBm; so, it has to be calculated with a separate PC application (*wsprcode.exe*) and then copied into the Arduino sketch for each individual WSPR transmitter.

Andy Talbot, G4JNT, provides *details* of the coding used in the WSPR packet and the necessary PC executable file to give the symbol string for your own station; you can find details on the site of *Anthony Le Cren*. See also the Wikipedia entry on *WSPR* that provides additional information.

When you have the *wsprcode.exe* program, you can generate the WSPR symbols for your particular station. Open a command prompt window and run the coding program using your own callsign, locator and transmitter power (in dBm). For example, for my 1 Watt transmitter, the instruction to enter is: *wpsrcode "VK1DSH QF44 30" > sym.txt* and this generates a text file called *sym.txt* from which the channel symbols can be copied into your Arduino sketch.

The other Arduino sketch setting that may require adjusting is the DDS frequency calibration factor. In the Arduino sketch this variable is called *CalFactor* and it can be adjusted to fine-tune the DDS frequency, if required. Adjust the value in steps of 100, recompile and upload the sketch and measure the new transmit frequency; repeat as necessary.

You can set the time of the RTC of the WSPR-*E* transmitter by opening a terminal session (use *PuTTY* or similar terminal emulator) between a PC and the Arduino. Enter the character t (just the character, no return) and the Arduino processor will respond with a prompt; then enter the date and time in this format: *YY,MM,dd,hh,mm,ss* followed by Enter; *YY* is the last two digits of the year, *MM* is the month, *dd* is the date, *hh* is the hour in 24-hour format, *mm* is the minute and *ss* is the second (each field must be two characters), so 20,12,06,13,05,10 would be 13:05:10 on December 6, 2020. The RTC will be set to this date and time when the string is entered, so it is helpful to be a few seconds ahead; type in the string then press Enter just as the second rolls over.

The RTC in my version stays within +/- one second of the correct time for several weeks. While I could have used a GPS-based clock, a standalone RTC is simpler, cheaper and adequate for the task.

Conclusion

I have described a simple, stand-alone WSPR transmitter. The project was easy to build, inexpensive and has worked flawlessly for many months.

The Arduino sketch is available to any interested reader and I will be happy to send it to anyone who asks (email: *vk1dsh@wia.org.au*). I thank Terry J MacCabe VK2MTJ for reviewing the article.

Inductor	Inductance	Turns (T50-2 core)
L1	5 uH	32 (0.4 mm dia wire)
L2	4.125 uH	29 (0.4 mm dia wire)
L3	0.157 uH	7 (0.9 mm dia wire)

Table 1: Inductor details for operation at 10 MHz. I used T50-2 ferrite toroids on which to wind the inductors. The wire diameter is nominal; use whatever is roughly the same.

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A RaspberryPi flavoured project

WSPRing on HF – no rig required

Grant Symons VK3ZTE

Having run WSPR using medium power on 2m for lengthy periods over the last few years, the overall experience has been occasionally tempered by considerations of energy consumption.

The aim of this project was to make a complete WSPR transmit and receive station without tying up expensive, power-hungry transceiver and computing equipment. For reasons mainly concerning variety, I chose the 40m HF band rather than VHF for the exercise, and notwithstanding a lack of recent coding experience, the challenge of running WSPR using common single board microcomputers without the need for any 'real' radios, warranted having a go.

The idea was inspired by an article in *Amateur Radio* by Erich Heinzle VK5HSE on fitting a Unix-based Raspberry Pi (RPi) single board computer with a transmit shield (this doesn't mean shield in the RF sense of the term, but an additional circuit board allied to the micro).

Through the incorporation of a cheap software defined radio (SDR) dongle, the system described here supports receiving as well as transmitting, albeit with the penalty of two additional RaspberryPis relative to the VK5HSE shield, thus making three in total. All of the necessary software is free and easily downloadable from the web.

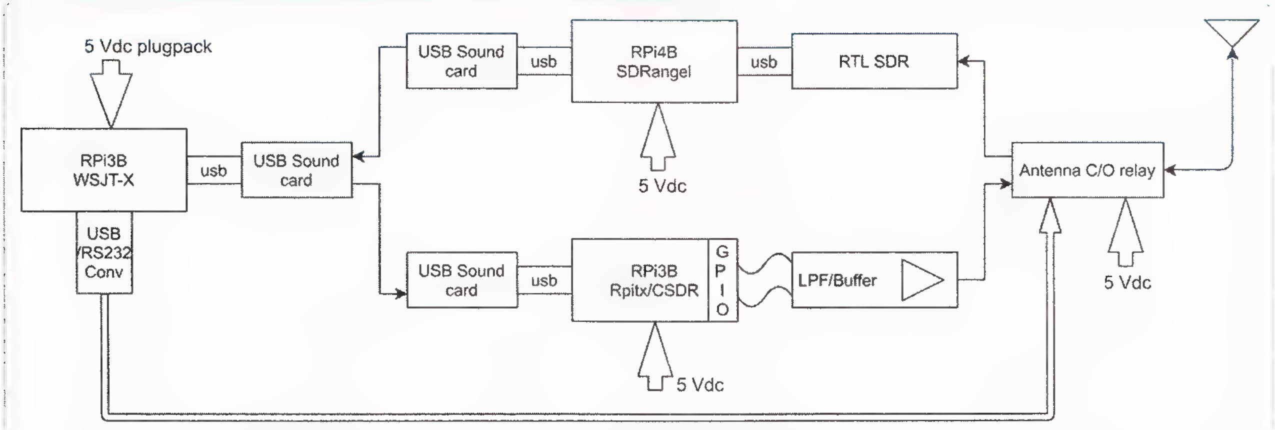
Configuration

As depicted in Figure 1, the system comprises three separate sub-systems:

- an RPi running F5OEO's clever rpitx software, along with the command line tool, CSDR, for performing digital signal processing, and its included functions library for the transmit function. It is worth noting that this rpitx sub-system can otherwise be used as the basis of a standard HF SSB transmitter, taking its baseband audio input from a microphone in the usual manner rather than tones from an RPi computer;
- for the receiver, SDRangel software running in direct sampling mode on a second RPi and a cheap HF-capable SDR dongle featuring a temperature-controlled crystal oscillator (NB: some SDR dongles advertised on the web are VHF-UHF only and do not support frequencies below 25 MHz, so for this purpose avoid them); and
- the cornerstone of the setup, a third RPi running the Linux (.deb file) version of the WSJT-X software set by K1JT, G4WJS and K9AN that facilitates transmit-receive (Tx-Rx) control, transmit encoding, receive decoding and also supports a host of digital modes including, as used in this case, WSPR. Of course, at the cost of bulk and power consumption, the same functionality could have been achieved with an old PC running the appropriate Windows version of WSJT-X and that would have offered the likely bonus of an inbuilt sound card for handling the incoming and outgoing audio tones.

I found that a standard RaspberryPi 3B handles these last mentioned WSJT-X software-driven control and encoding/decoding functions without any issues other than a high-ish processor temperature of around 50deg C, but with no mechanical cooling and 25deg C ambient.

Figure 1. The block diagram is quite straightforward, showing the receive signal path at the top and the transmit signal path at the bottom. All the components are powered from a 5 Vdc plugpack.



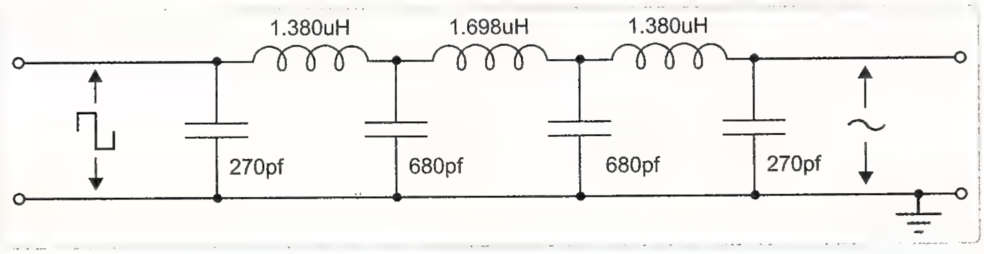


Figure 2. The low-pass filter (LPF) for the 40m (7 MHz) band, showing the preferred values for the components. The two 1.38 uH inductors are made by winding 19 turns of 26 SWG enamelled copper wire on a T37-6 yellow toroid. The 1.698 uH (OK, 1.7 uH!) inductor is also wound on the same toroid using 21 turns of 26 SWG enamelled copper wire.

Another is rather lightly loaded, running the rpitx transmitter software with the processor sitting at around 35deg C, although after some hours of operation, it complains about having run out of memory, at which point it needs to be re-booted.

I'm looking to upgrade the transmitter to an RPi4 with 4 GB of on-board memory so that it can hopefully operate indefinitely, without intervention, like the rest of the setup.

In 2020, F5OEO revised rpitx to be compatible with the RPi4 so the upgrade now looks feasible.

Coming to the receive function: there are several options on line for downloading the free SDRangel software on to an RPi running either the usual Raspberry Pi OS, or the common alternative, Ubuntu, operating systems, but I took advantage of a convenient, easy to use, Raspbian package pre-loaded with SDRangel.

It seems that the receive processing requires a little more computing grunt than the other two functions, and getting SDRangel to work with the SDR dongle on HF – which requires setting SDRangel to direct sampling mode – proved fairly unworkable on an RPi3B, but works effortlessly on an RPi4 with 4GB memory.

The RPi4 processor runs at around 45deg C but helped by a small fan. Of course, it's worth noting that SDRangel is not the only option for receive; there are other free packages, including SDRSharp, for example, so the adventurous need not be limited.

An interesting consideration is that SDRangel, as well as supporting receive, has transmit capability. It might therefore be possible to combine the transmit and receive functions into a single RPi4, saving an RPi, and someone might like to try and achieve this.

Synthesis and transfer of the coded audio frequency baseband tones between the WSJT-X RPi and the transmit and receive RPis is facilitated by three cheap, interconnected, USB sound card adaptors with 3.5 mm phono jacks, nominally for supporting microphone and headphone connections.

A phono lead takes the coded audio from the headphone jack on the WSJT-X RPi USB adaptor to the microphone jack on the transmit RPi. Similarly, for the audio frequency baseband from the receive RPi, the third USB adaptor and second phono lead conveys the receive signal to the microphone jack on the WSJT-X RPi for decoding.

To avoid confusion, it's worth noting that, in the case of the VK5HSE RPi/shield and F5OEO associated software referred to above, the combination not only produces the WSPR-modulated transmit signal, but manages the transmit duty cycle and frequency choice, too. It thus negates the need for the separate control RPi running the WSJT-X software, but at the costs of requiring command line programming and no receive function.

The approach taken here is to keep the Tx/Rx control function and baseband signal coding/decoding separate from the upper sideband transmit function. Using WSJT-X to manage control provides a Tx/Rx changeover signal via a cheap USB/RS232 converter and that is used to activate an antenna relay for switching between the transmit and receive RPis.

I chose to use a small off-the-shelf RF Power Relay by Makis Katsouris SV1AFN that comes with SMA connectors and some on-board electronics separating the power for the relay coil from the RS232 switching signal from the WSJT-X control RPi.

Implementation

As explained in the VK5HSE paper, and by F5OEO and others, turning an RPi into a transmitter entails using its harmonic-rich GPU clock output which must be low-pass filtered to convert it to a clean modulated signal. I used a convenient cheat sheet by George Dobbs G3RJV that provides suitable preferred component values to build a simple seven-element LPF – refer to Figure 2.

The filter is driven by a BS170 FET buffer amplifier that, in turn, gets its signal and power from the rpitx/CSDR RPi transmitter via a 40-way ribbon cable. The BS170 is surrounded by a handful of components for biasing. This arrangement was lifted straight from the VK5HSE design – refer to Figure 3 for the schematic. As explained by VK5HSE, the BS170 quiescent current is set to around 30 mA via the 20k biasing pot by aiming for 30 mV measured across the one ohm drain resistor.

A further important point to note is that the connections on the RPi GPIO header are referred to in the literature under two distinct systems – pin number on the connector,

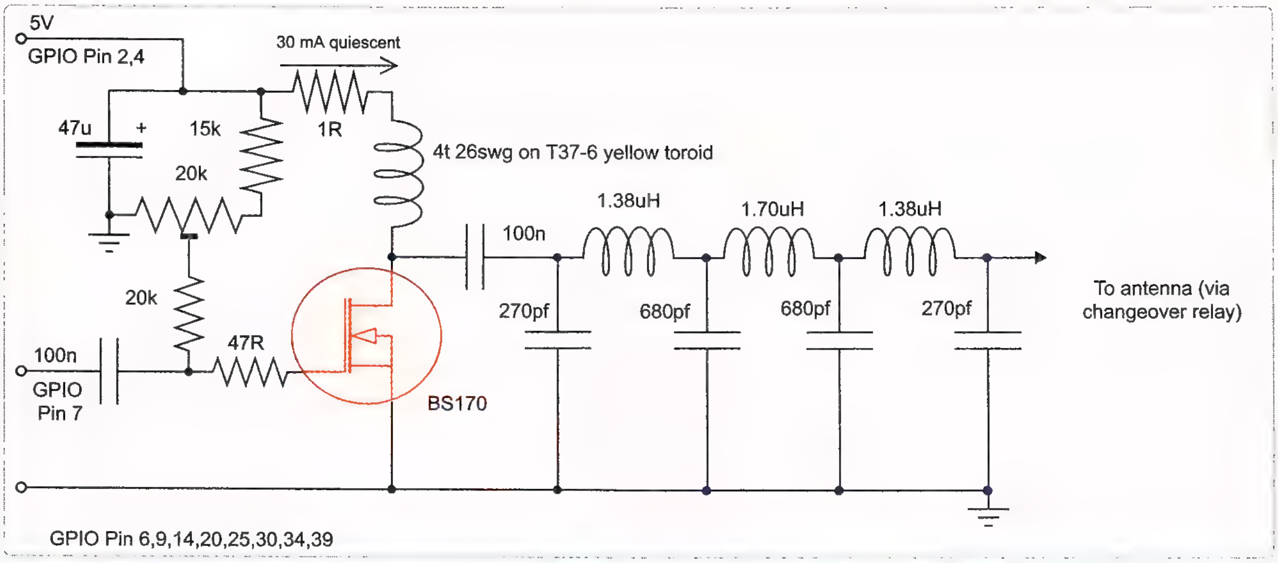


Figure 3. The RF output stage buffers the squarewave digital signal delivered from Pin 7 of the GPIO (general purpose input-output) connector with a BS170 switching FET. The signal at the FET's drain is 'cleaned-up' by the LPF shown in Figure 2. The FET's drain load is an inductor wound on a T37-6 yellow toroid, using 4 turns of 26 SWG enamelled copper wire. The BS170 quiescent current is set to around 30 mA via the 20k trimpot to get 30 mV measured across the 1R drain resistor.

e.g. pin 7 for GPIO_GCCLK, and the corresponding GPIO number being, in this case, GPIO4. For the purpose of Figure 3, I've used connector pin numbers.

Operation and performance

One issue that needs to be addressed is that of frequency accuracy. With only a 200 Hz WSPR allocation to play with, the demands on knowing where you are in the band are a bit tougher than we are mostly used to on 40m.

Both Tx and Rx RPis are left powered-up throughout the entire Tx/Rx cycle and drift hasn't proven to be an issue with these RPis – my experience has been that the Tx Pi stays within 1 Hz or so throughout the two-minute Tx periods and the Rx Pi likewise – but their frequency accuracy is another matter.

Currently, my Tx Pi had to be set for 7028.905 kHz to achieve the required 7038.600 kHz carrier frequency, and the Rx Pi is set for 7038.195 kHz to tune 7038.600 kHz.

The need to set significant deltas begs the question as to how to tie down one's frequency within, say, 10 Hz or so. Obviously, a well-equipped shack with a high resolution, highly accurate counter and/or signal generator pretty much solves the problem. Likewise, an accurately calibrated station transceiver (preferably GPS-locked) would provide another alternative.

There exist many possibilities, but I should mention two further points: because the Rx and Tx frequency settings are independent, one really only has to pin down one or the other because, providing they are not too far apart, you can see your Tx signal on your Rx display.

Finally, averaging out one's reports coming in via WSPR net provides useful guidance from myriad other stations as to where you are in the band.

Satisfactory WSPR operation also requires a reasonable degree of time synchronisation between transmitting and receiving stations. Generally, it seems that the WSJT-X software will decode satisfactorily with differences of up to a few seconds, and this is accommodated by the control RPis using the Network Timing Protocol via WiFi.

Operating in a typically noisy suburban location with a simple half-wave inverted V dipole, the 200-odd milliwatt transmit power and the SDR receiver, there is no shortage of stations to be logged both ways, including VKs, ZLs, north American stations and occasional others.

Conclusion

An efficient plugpack-powered WSPR station is described with the potential to operate 24x7 without tying up lots of expensive radio equipment or consuming much power. Given the ubiquity of RaspberryPis, I wonder whether the project might even provide an attractive entry point for prospective newcomers to amateur radio, perhaps having an IT background but less confidence with radio.

Any enquiries about further details are welcome. I can be contacted via email, at: *grant.symons@optusnet.com.au*

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SWR and the meaning of life

Jim Tregellas VK5JST

We all know about SWR – standing wave ratio – because, over our lives we have all gathered a lot of information on the subject from our ham and CB friends, and other reliable sources, such as the American educational movie series entitled "Smokey and the Bandit".

All of these sources clearly demonstrate that unless the "SWAR" of our antenna system is less than 1.05, then we will not be heard, our finals will blow up, we will get RF burns from the metal parts of our microphones and rigs, and we may actually end up sterile from the excessive RF in the shack. Right? Errm, well, not quite.

Amateur radio is full of tall tales and true, and nothing has more nonsense spoken about it than the SWR of antenna systems. So, let's look at some hard facts and try to establish some truth.

About signal strength

Back in the 1930s, It was generally agreed that 50 microvolts RMS of RF at the input terminals of a radio was an strength nine – S9 – signal (large), but that was about the extent of the agreement because receiver input impedances varied widely and so did the receiver automatic gain control (AGC) characteristics, noise performance and overall gain.

It was not until the early 1980s that an attempt at some standardization was made by the International Amateur Radio Union (IARU) and signal levels were defined that should produce particular readings on a receiver's S-meter. The receiver input impedance assumed for these 'standards' was 50 ohms and the voltage levels defined are shown in Figure 1.

"S" READING	INPUT SIGNAL-MICROVOLTS
S1	0.2
S2	0.4
S3	0.8
S4	1.6
S5	3.2
S6	6.3
S7	12.5
S8	25.0
S9	50.0
S9 +10dB	160.0
S9 +20dB	500.0

Figure 1. Signal strengths and the related receiver input voltages.

Note that a change of one S-point doubles or halves the voltage to be found at the receiver input (or a 6 dB change). This logarithmic scale has some interesting consequences. Say a distant transmitter of 100 Watts is producing a strength seven (S7) level in your receiver. To boost the received signal to S8, the voltage at the receiver input must double, and so the transmitter power must be quadrupled to 400 Watts to cause this. An S9 signal level will require a transmitter power of 1600 Watts!

Also note that this quadrupling of transmitter power produces a fairly minor change in the received audio level due to receiver's AGC action. It is worth noting that, even in these days of very advanced receivers, AGC action is seldom exactly logarithmic and S-meters still typically tell the small lies loved by salespeople everywhere as they boast about the behavior of their products.

Power loss at various SWR levels

The next item that must be addressed is what power loss is implied by various SWR figures?

Have a look at Figure 2 and prepare to be surprised. Even at an SWR of 3.0, the power loss in the antenna system is just 25%, which, given the four-fold increase in power level needed to move just one S-point, only represents a change of a very small part of an S-point, and essentially no change in the received audio level at all.

For an SWR of 1.5 or less (4% loss), you will not even see the S meter needle move, and you will certainly not be able to detect any change at all in receiver audio level.

So given the above, why all the fuss about SWR?

SWR	POWER LOSS %
1.0	0
1.1	0.2
1.2	0.8
1.3	1.7
1.4	2.8
1.5	4.0
1.75	7.4
2.0	11.1
2.5	18.4
3.0	25.0
5.0	44.4
10.0	66.9

Figure 2. The power lost at various levels of SWR.

Standing waves in an antenna system

Standing waves develop in an antenna system as a result of the impedance of the system not matching the output impedance of the transmitter. As the output of the transmitter moves through a series of cycles of a (hopefully) good clean sine wave, each cycle moves down the transmission line toward the antenna and away from the transmitter at either the speed of light (open-wire lines) or some fraction of the light speed.

In the case of coaxial cables with solid plastic dielectrics such as RG58, these wave fronts move at around 66% of the velocity of light (or RF). Cables with foam dielectrics have lower losses and faster moving wave fronts (typically 0.8-0.9 of light's velocity). The speed of propagation relative to the speed of light is known as the 'velocity factor'.

When each wave front reaches the system termination, its energy may be totally absorbed and radiated by the antenna (a perfect match of 50 ohms), or some energy may be reflected back towards the transmitter.

In the first case, as there is no reflected energy, no standing wave can develop and the RF voltage along the transmission line will be exactly the same at all points on the line. This is illustrated in Figure 3 by the yellow trace in the graph.

In the second case, the amount of reflected energy will be determined by how close the terminating impedance is to 50 ohms. For a SWR of 1.5 (little reflected energy) the terminating resistor in a 50 ohm system can be either 75 ohms or 33.33 ohms as both of these generate this SWR figure.

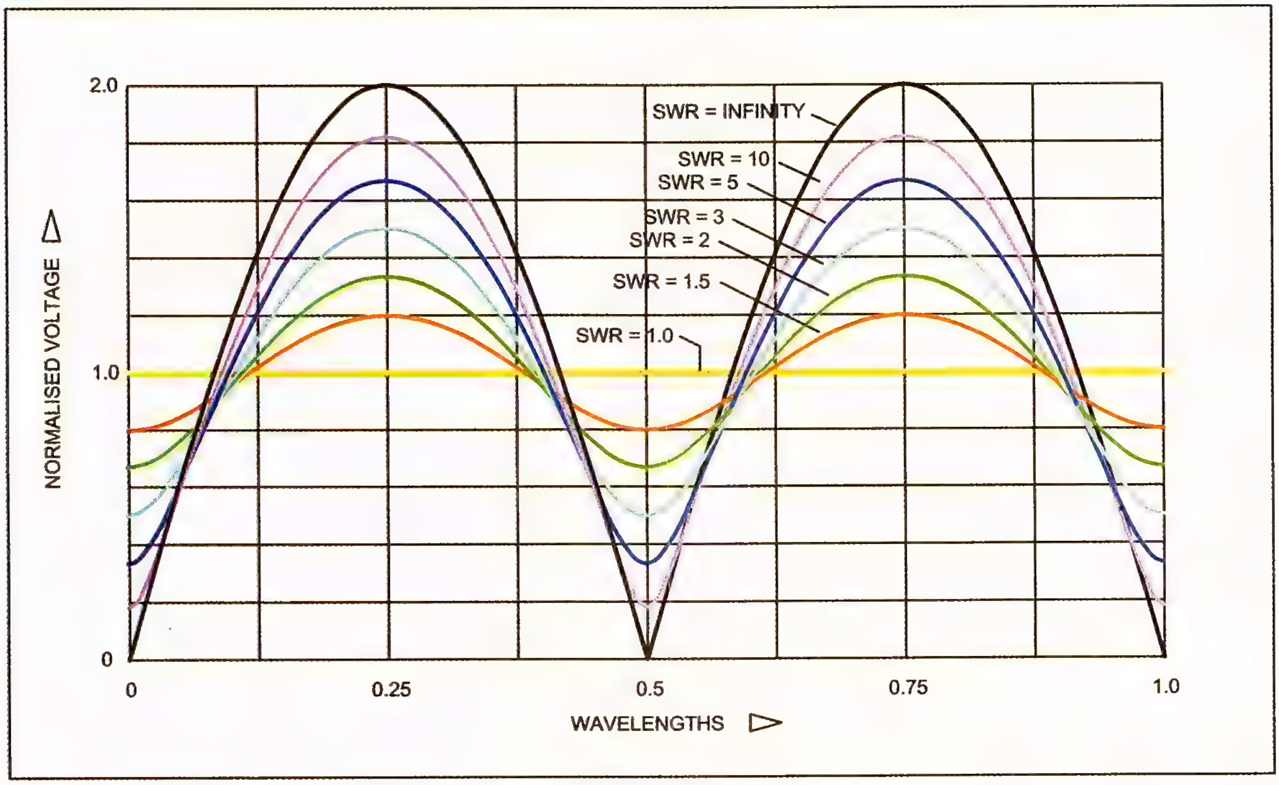
This same idea of two different loads generating the same SWR also applies to a system with either a shorted or open-circuit load. No energy can be absorbed in these loads and so the SWR is infinity (the black trace).

In Figure 3, note that, as the load SWR moves away from the perfect 1.0 in either direction (either greater or lesser impedances than the perfect 50 ohm termination), the voltage maximums and minimums along the transmission line increase as the forward and back waves interact. And this is what causes the concern with SWR figures.

It is also worth reflecting on what happens to the RF current along such a transmission line. It has the opposite shape to the standing wave for voltage. As power is being transmitted, when the voltage is maximum then the current is minimum, and vice versa.

The final part of the picture is that transmission lines are seldom of the right length. It is entirely possible that the transmitter output might just be coupled to a line with a voltage or current maximum that appears right at the transmitter output and so places the output devices under the maximum possible stress.

Figure 3. Illustrating the voltage maximums and minimums (maxima and minima) along a transmission line at differing SWR values.



So it is worth looking at Figure 3 in more detail, because it clearly shows the compromise a design engineer must make when designing an RF output stage. On one side is a sales engineer screaming that, to compete with the opposition, he needs the maximum possible output power and on the other side is an accountant moaning about the costs of expensive RF output devices.

The nett result of all this pressure is that the RF output devices in a transceiver are generally flogged to within an inch (cm . .) of their lives, and little safety margin is left. Typical industry practice is therefore to provide full output power up to an SWR of 1.5 (25% over-voltage) and after this, to back-off the drive to the RF output stages with ALC. And this protection happens fast. If you happen to have an antenna system with an SWR of 3.0 then you will be lucky if your modern 100 Watt transmitter is actually putting out 20 Watts.

Of course, a lot of the mythology about SWR stems from the early days of CB, when output stages were totally unprotected (costs again), and even the shortest exposure of a transceiver output stage to an open or shorted line would result in either 200% overvoltage or current that would immediately destroy the output transistors.

It should also be pointed out that the tube output stages of old "boat anchor" rigs are way less likely to be damaged by these factors. First, these output stages almost always have "Tune" and "Load" controls that allow impedances other than 50 ohms to be perfectly matched and, secondly, tubes have far greater margins available to deal with overloads anyway.

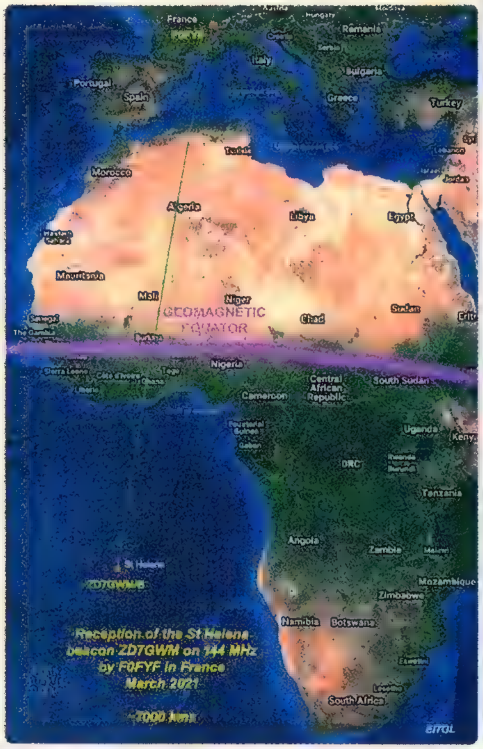
Most "boat anchors" will happily deal with SWRs of 3.0 or more without complaint.

Finally, it is interesting that many international broadcasting stations that have to be very frequency agile above the 40m ham band to take advantage of current propagation conditions use antenna systems with SWR figures of up to 9.0. Why? Because it is cheaper to design a very tolerant transmitter output stage than to design and construct a very wideband antenna system.

Summarising

So in summary, provided your SWR is less than 1.5, there will be no ill effects at all – and with most boat anchors you can get away with murder. **But**, if you want to be heard all of the preceding discussion assumes that you have an *efficient* antenna system. You can easily get a very low SWR at 2m by connecting a 144 MHz transceiver to a 100 metre length of RG58 with the far end being open circuit. Lots of hot plastic, no reflected power back to the transceiver, and a measured SWR of less than 1.1:1!

144 MHz beacon in South Atlantic heard 7000 km away in France



The recently installed 144 MHz beacon on St Helena Island in the South Atlantic off the coast of West Africa, was copied by Jeff FY0F on 5 March 2021. As reported by John EI7GL, the path is almost 7000 km, as illustrated on the map here.

FY0F recorded signals of the ZD7GWM beacon on 144.475 MHz for a period just shy of two hours, from around 9pm to 11pm local time. This time period, together with the signal characteristics, strongly suggests the propagation was Class 2 (evening-type) transequatorial propagation (TEP). Check out this 29-sec recording: https://soundcloud.com/f0fyf/beacon2

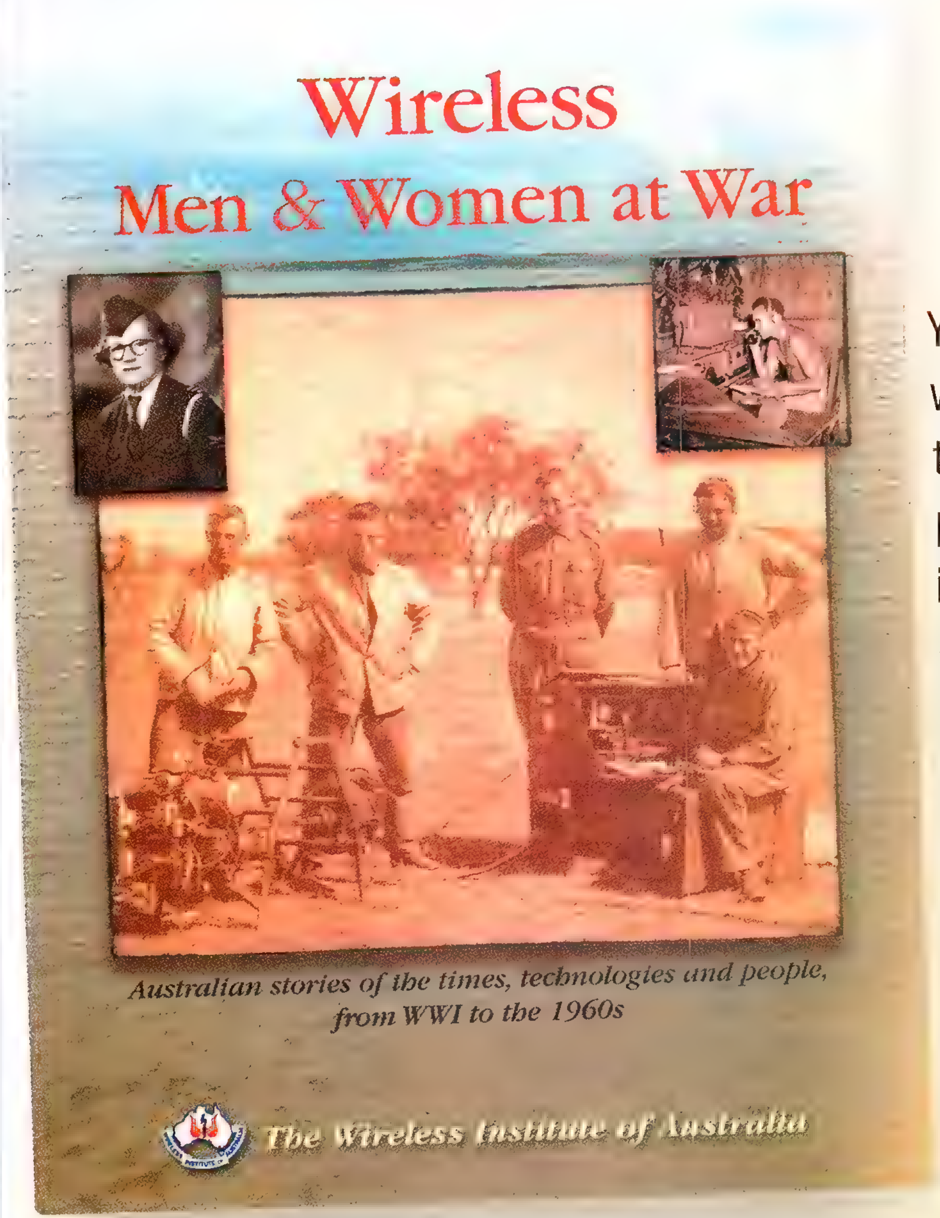
To copy the beacon, Jeff was using a stack of 2 x 9-element Yagis at 7m height above ground, mounted on a temporary mast.

There is some discussion online about the audio recordings of ZD7GWM off-air by FY0F during this session, which don't match some characteristics of other recordings of the beacon.

To learn more about Evening Type Transequatorial VHF Propagation, visit: *http://home.iprimus.com.au/toddemslie/eTEP-Harrison.htm*

Roger Harrison VK2ZRH

Wireless Men & Women at War


Wireless
Men & Women at War
Australian stories of the times, technologies and people, from WWI to the 1960s
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The HF Radio Club Inc (HFRC)

HFRC is an Australia wide non-profit organisation supplying HF Radio based communications services to its members.

The club has nine HF frequencies and four strategically placed Bases in Queensland, New South Wales, the Northern Territory and Western Australia.

HFRC members are from all States and Territories across Australia. HF Radios are in motor homes, caravans, cars and 4WDs.

There is no better guarantee of safety if you need help, day or night. The Club provides 24/7 HF Radio access, through its bases, to the Royal Flying Doctor Service.

We have daily scheduled chat times (skeds) for our members on the East coast, the Centre of Australia and in Western Australia.

Any member can radio call another member's radio outside of sked times. The use of selcall to alert another member of an incoming call is an asset to such communication, providing the member has activated the scanning mode.

For a small additional annual fee, the **HFRC** "Travellers Package" (TP) allows members to make HF Radio connected phone calls to family and friends in Australia when there is no phone service available.

There are four bases located throughout Australia: Townsville and Holbrook (Hume) in the east, Alice Springs in central Australia and Cue in the west. Each base has its equipment housed in a secure cabinet in a locked shed. Each base has 9 channels:

Ch 50 3890.5kHz,
Ch 52 5135kHz,
Ch 53 9985kHz,
Ch 54 11497kHz
Ch 55 14662kHz,
Ch 56 7899kHz,
Ch 60 6790kHz,
Ch 62 12197kHz,
Ch 63 15972kHz
(Analogue or Digital Mobile to Mobile).

Hume Base

The transmitter is a Codan NGT HF Radio with 100 watts of power with a 13.6 volt power supply. The antenna is a 22W Moonraker vertical (6.7m) with plenty of ground plane, with an SG-230 Smartuner attached. A 3033 Telephone Interconnect modem links the Radio to the telephone system.

The **HF Radio Club Inc**. has now progressed to the stage where its total offerings are now possibly unsurpassed by any similar club in Australia. It is different from the WIA and offers facilities as explained below for travellers and their families and friends within Australia.. We have a dedicated management committee, a highly qualified technical support group, audited accounts plus annual elections and more. Monthly meetings with minutes are always available to members. All aiming to be a transparent club to our members.

From very humble beginnings, the club has gone from strength to strength. By law it is required that an ACMA Type Approved Land Mobile Radio such as a Codan or Barrett can be used. Joining costs are just $25. Full membership HFRC members have access to all of HFRC facilities at $100pa. Basic HFRC membership offers a little less at $80pa. Every membership has access to the RFDS. You receive a selcall and an Authority to Transmit on our Club Channels.

Membership benefits

Daily 'fully logged to ACMA standard' skeds from the east coast, central Australia and the west coast (all members can search daily sked logs on the HFRC website). You can log in daily or occasionally to help keep track of your travels and allow other members or family to be able to find your location. You can have a chat and find out about weather conditions, road closures, bush fires, and good camping spots. These skeds keep you in touch and give you confidence

We have the only fully compliant ALE (Automatic Link Establishment) network available to Non-Government users in Australia. This allows suitably equipped member's radios to automatically determine what frequency and base will be best at any time of the day. This is a real asset when wanting to make a mobile phone call on the radio. It really works almost like a mobile phone and is better, cheaper and more reliable than a satellite phone.

Access to the Royal Flying Doctor Service without requiring third party assist direct from your radio via an HFRC base - with ALE profiled equipped radios the single RED button press method automatically selects the best frequency and HFRC base to automatically and speedily connect you direct to the RFDS. There is no going through triple zero (000) – it takes you straight to a trained RFDS operator. Remember when talking on the radio to say "over" and there only be one person talking at a time (just like a QSO).

Members can equip their vehicle with a simple GPS that can send your current position to one or a group of pre-nominated email addresses. This can be delivered with name plus position and with an embedded Google Maps link. GPS position can also be sent to a base or another radio. The latest Codan radio with ALE makes this so easy with no more guessing what frequency for RFDS or

GPS calls to our bases.

We provide the ability to send short Emails from your radio via a HFRC Base to pre-nominated email addresses anywhere in the world. You can also send an SMS to Australian mobile phones from your radio.

Phone calls can be made to any Australian phone number from their radio though HFRC bases. These are normally limited to six minutes, due to time out settings. Just remember that your phone call may be accompanied by static and to practice good radio procedures.

Our Technical Support Group are constantly developing new innovative services for Members. The huge interactive Website provides all about these and other information: members details and contact information, sked logs, message facilities, a massive forum, library and club documents including minutes, newsletters, social gatherings, photos, and much more. Members have full access to so much on the website *https://hfradioclub.com.au/*

Why might you as a WIA member want all of these facilities? If you are travelling miles from any town, or remote station or in a desert and you have a situation such as car breakdown, sudden severe illness, come across an incident or accident requiring medical or police or mechanical assistance, your HFRC membership offers you the immediate help you require.

In 2018 two of our members chanced upon a family of dad and mum and three children stranded in the Simpson Desert because of engine mechanical failure. They had not seen anyone for days and were running low on food and water. Using HF radio and using the HF Radio Club's facilities allowed a mechanical repair rescue to be organised, food and water to be transported to the stranded travellers and a successful happy ending. Whilst awaiting rescue after organising assistance, no other travellers were seen for a further two days. Supposing that you as a WIA member already have an amateur radio in your vehicle, "who are you going to call" to get urgent assistance or be rescued?

The HF Radio Club Inc can be your best friend while travelling in remote locations because of the facilities we offer to members.

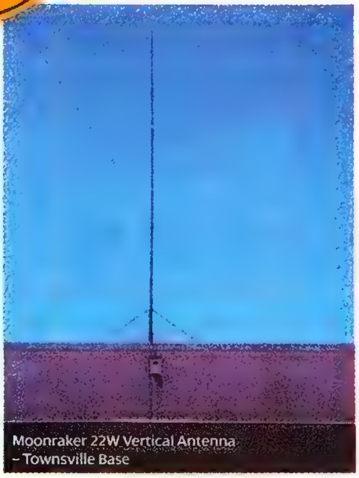
Please visit us at *https://hfradioclub.com.au/* or phone 0491 349 691 for more details. Our easy to download and complete application form awaits you on our website.

Prepared *by Barry Smith, Jacqui Deering VK5KFM*, and *Roger Cordukes VK4CD.*

VKE 237

HF Radio Club Inc.

PO Box 1656 Charters Towers, Qld. 4820



Moonraker 22W Vertical Antenna
– Townsville Base

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Our motto: ***"Safety First and Friendship Always"***

WE WELCOME NEW MEMBERS

For further information check out the Website: *https://hfradioclub.com.au/*

Email: *hfrc.secretary@hfradioclub.com.au*

Mobile: **0491 349 691**

My Uniquely GippsTech 10 GHz Adventure

How I gave up HF 'black box' operations and took up with a 'White Box' on microwave

Justin Giles-Clark VK7TW

The adventure begins!

As with many amateurs in VK7, my 10 GHz adventure started with widely known, peripatetic and famously garrulous Rex Moncur VK7MO. He very kindly gave me his re-purposed Microwave Associates 'White Box' transverter. This ex-commercial service equipment has appeared on the surplus market in Australia, the UK and Europe. Rex's White Box had been expertly converted by Ralph VK3WRE back in 2000-2001 as a GippsTech project and this particular one was used by Rex during his initial experiments on 10 GHz.

For readers unfamiliar with the term GippsTech, it refers to the (previously) annual Gippsland Technical Conference held at the Federation University campus in Churchill, eastern Victoria since 1997. Convened by Peter Freeman VK3PF and ably supported by the Eastern Zone Amateur Radio Club, GippsTech is held over a weekend in June or July. It offers a series of presentations over all-day Saturday and the Sunday morning, by amateurs for amateurs with a focus "on techniques applicable in the VHF, UHF and microwave bands, especially for weak-signal contacts." The event gathers an eclectic mix of presenters and presentation topics, drawing an enthusiastic audience of around 100-plus. Covid restrictions forced the event's postponement last year, but plans are afoot for its return in July this year. See: *www.vk3bez.org/*

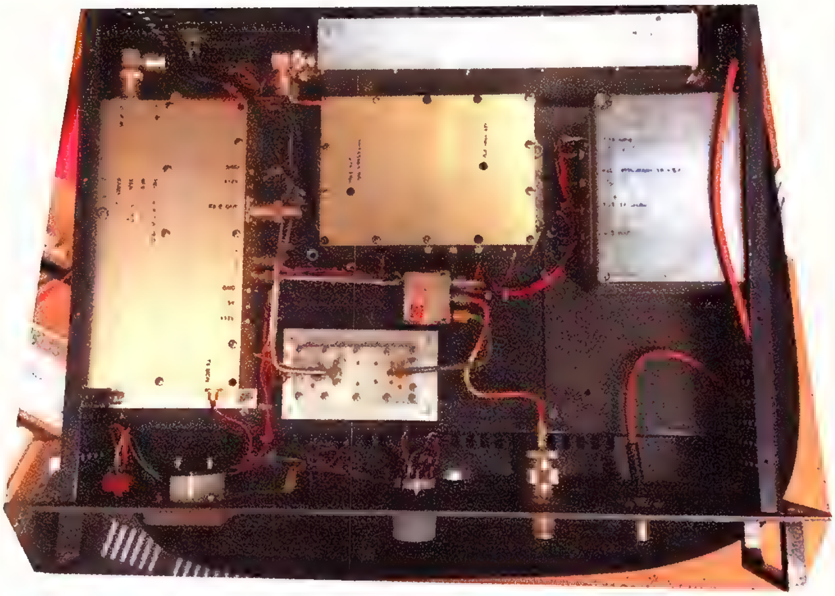


Photo 1. The original White Box conversion offered at GippsTech 2000-2001. This rig started the author's uniquely 10 GHz adventure thanks to the GippsTech Conferences over nearly 10 years!

Improvement #1 – hearing aid

Ralph VK3WRE presented the F6CXO conversion to create a low-cost 10 GHz preamp from a satellite dual channel low noise amplifier (LNA).

This was originally used to make the White Box a little less deaf. The testing of this amplifier led me to experiment with YIG Oscillators as 10 GHz test sources – yet another GippsTech past presentation.

I then came across some surplus commercial 10 GHz equipment that had a higher-spec 10 GHz LNA that made the White Box hear down to -135 dBm minimum detectable signal (MDS) and this was pressed into service.

Improvement #2 – GPS-locking

The next improvement was the GPS locking of the transverter. I became aware of this conversion following discussions with Ralph VK3WRE at GippsTech 2012. Ralph used the VK3XDK Agile PLL to generate the White Box local oscillator at about 106 MHz. The output level proved a little low, so this needed an amplifier and a Minikits GALI-84 amplifier was used (*www.minikits.com.au/*).

I ended up using a ZLPLL frequency generator (yet another GippsTech presentation!) in a very similar way, along with the Minikits GALI-84 to boost the signal to the level required for the multiplier.

Improvement #3 – dishes and feeds

I began with an 850 mm offset-feed dish; the original feedhorn conversion was undertaken by Ralph VK3WRE following a presentation at GippsTech 2014. The offset-feed dish is mounted on the novel AZ-EL mount made from re-purposed washing-machine parts

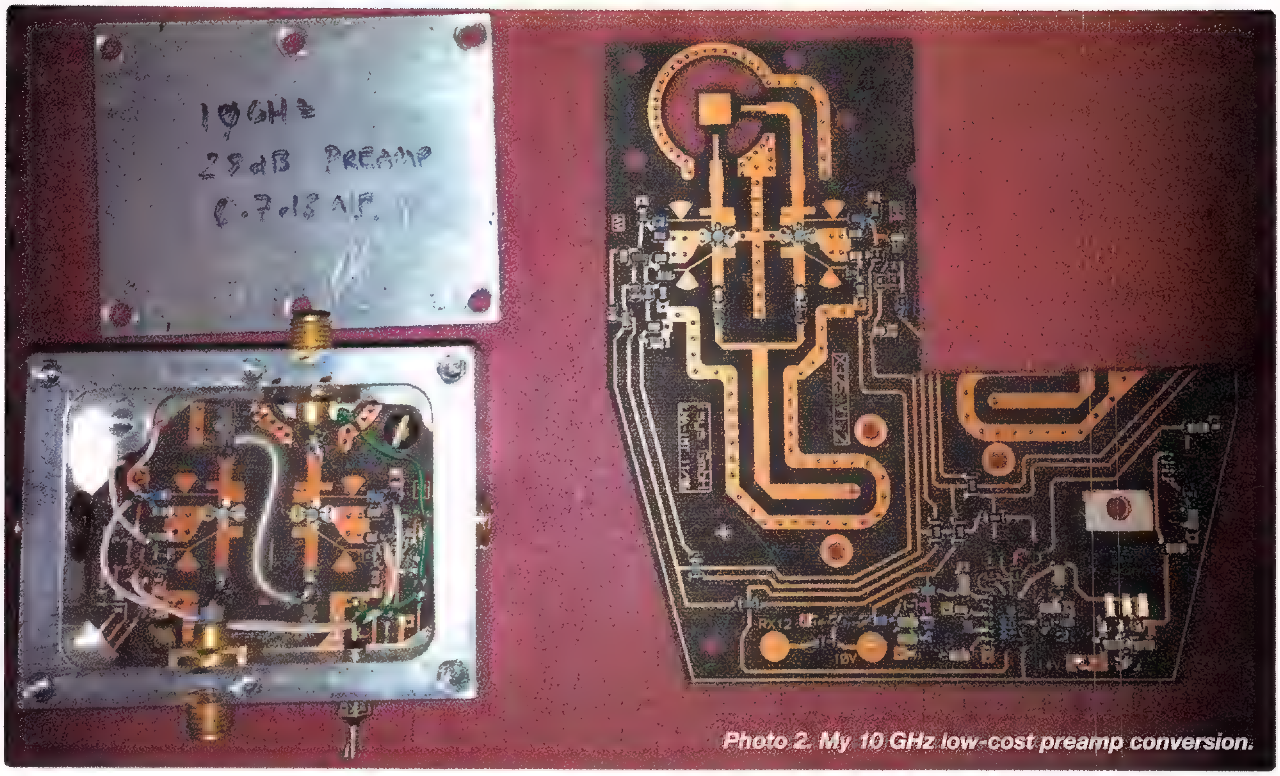


Photo 2. My 10 GHz low-cost preamp conversion.

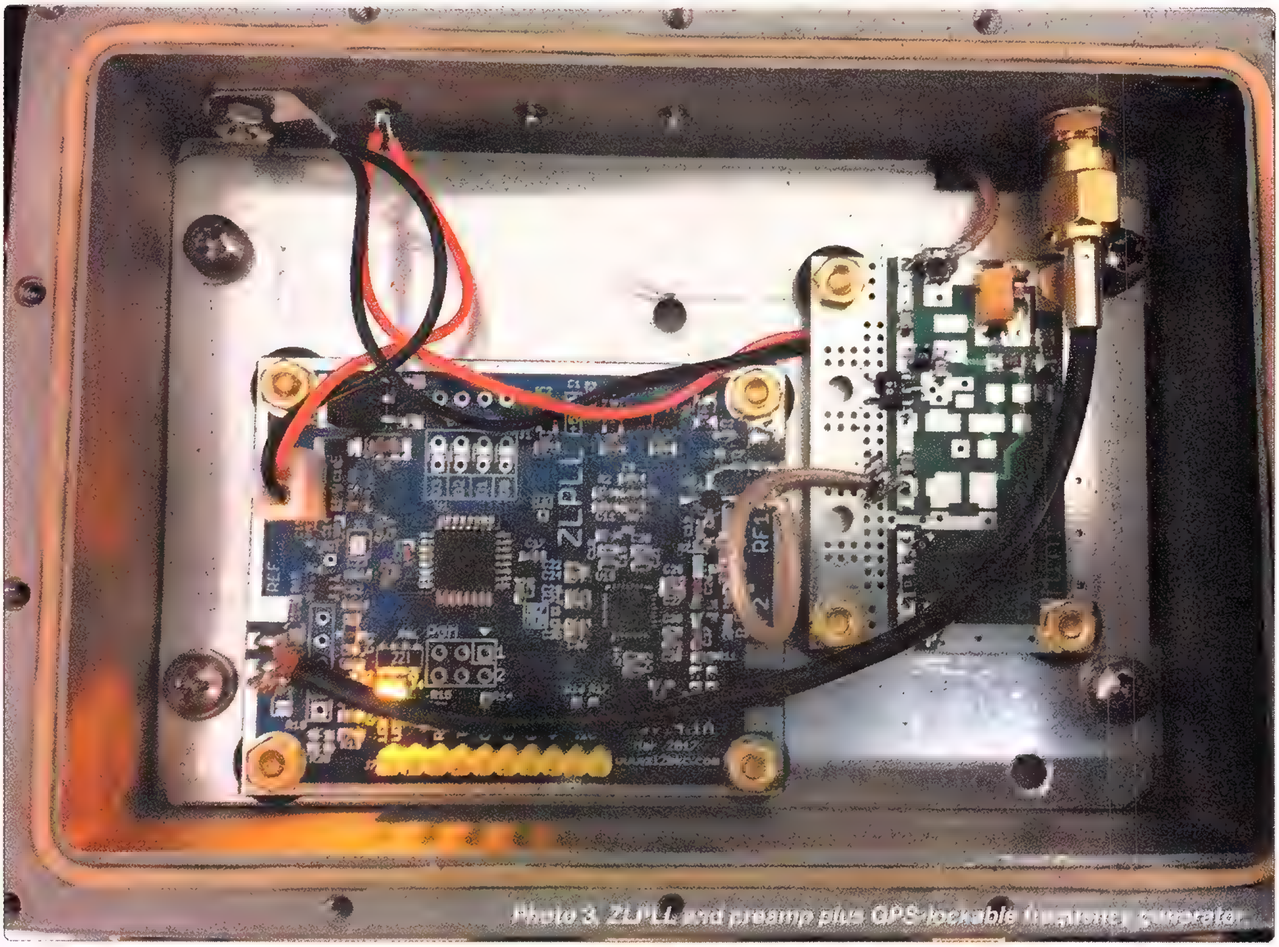


Photo 3. ZLPLL and preamp plus GPS-lockable frequency generator.

that I presented at GippsTech 2015.

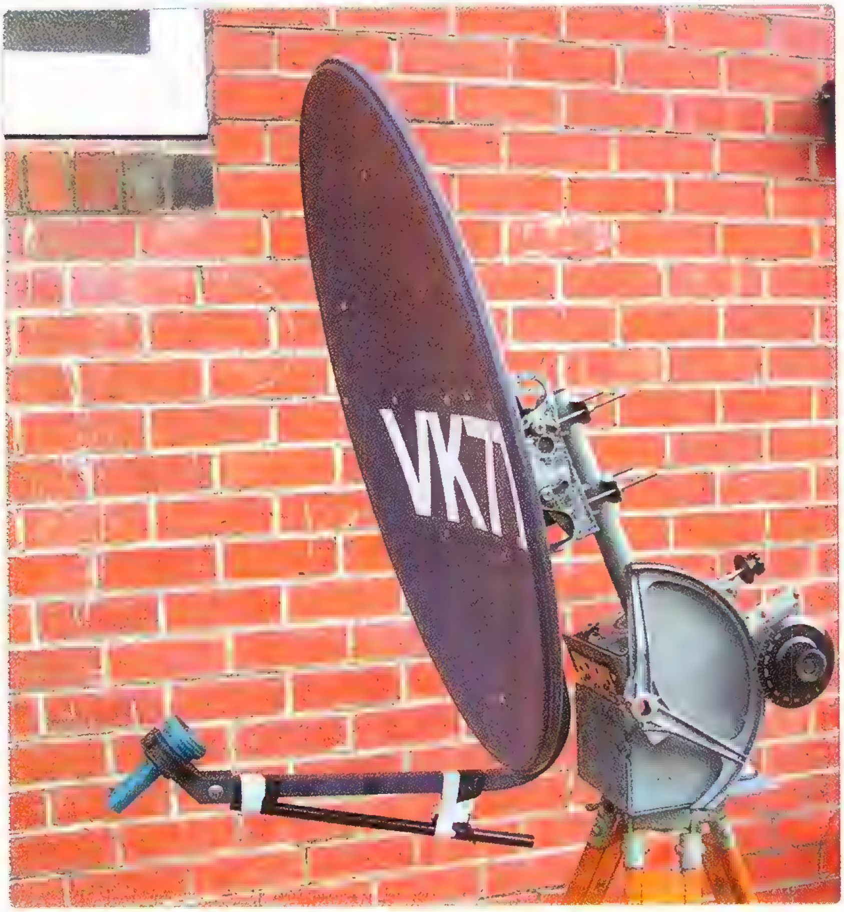
The mount was updated using a heavy duty Az-El closed-circuit TV (CCTV) mount that was originally manually driven and then updated through the use of a K3NG GPS-locked Az-El controller featured at GippsTech in 2019 and in *AR* Magazine Volume 87 Number 5, 2019.

Further to the dish improvements came with compliments of the Tasmanian Hydro Electric Commission's (now Hydro Tasmania) Microwave Link Renewal Project. This project was implemented by NEC Australia and saw them contact the Radio and Electronics Association of Southern Tasmania (REAST) and ask if we were interested in the surplus dishes and electronics. Of course, we said *yes!*

The MITEC 1.2 metre diameter dish comes with a 300 mm shroud and radome that were removed.

Photo 4b. The 850 mm offset-feed dish achieving first decodes of 10 GHz beacon off the moon.

Photo 4a. The 850 mm offset-feed dish with novel azimuth-elevation (Az-El) mount.



One recommendation for the 1.2 m dishes is not to remove the aluminium strengthening strap from the outside of the dish. This strap stops the dish from distorting and splitting – thanks to Rex VK7MO for that advice!

The dish came with a tuned "shepherd's crook" feed and a tuned transition to SMA connector; this is the same type of dish that is featured in many of Rex VK7MO's GippsTech presentations on record-breaking 10 GHz expeditions.

A dish of this size is vaguely portable if there is no wind and the tripod is pegged or guyed down.

I recently moved to an Andrews 600 mm diameter 10 GHz dish with a dielectric feed, to provide less feed blockage; these dishes have also featured in some past GippsTech presentations.

Improvement #4 – more power!

The White Box output at 1 0GHz is nominally 150 mW, thus I was looking for more power. I compared the Kuhne offering and the Down East Microwave (DEMI) offering and chose the (DEMI) 3 Watt power

Photo 4c. The [illegible] diameter prime focus MP50 Dish at the VHF/UHF Summer Field Day 2020.

amplifier (PA) kit for US$225 back in 2017. I did a timelapse movie of the construction of the power amplifier, shown at GippsTech 2017 and available on my YouTube channel.

Initially, I was skeptical that a homebrewed 10 GHz PA could deliver the 3 Watts, as specified. However, following the well laid-out instructions, the completed amplifier was taken to the VK7 Microwave Test Laboratory – otherwise known as the Shack of VK7MO – for testing.

For +10 dBm input, there was an output of 2.7 Watts and the power supply current rose to about 2.3 amps. Taking into account the losses of the connecting coaxial cables and SMA connectors, this amplifier was performing as specified.

The device is about 10-15% efficient and certainly needs to be mounted on a heatsink.

I am currently working on a printed circuit board design to accommodate a CREE/Wolfspeed CMPA801B025 – 25W 10 GHz GaN MMIC (0.5 W in for 25 W out). These devices are currently available for between US$250-$350.

Help has been offered from microwave engineers

Photo 4d. The 60 cm diameter prime focus Andrews dish with dielectric feed – calibrating the scope based on Sun noise.

who attend GippsTech and this advice is considered invaluable. This power will enable me to work weak signal digital EME with the larger EME stations when lunar degradation and libration is low.

Summary

The VK7TW White Box now looks a little different and certainly performs better than the original. This has been due to the knowledge gained through many trips to GippsTech over the years.

Hopefully, this article has given you an idea of my 10 GHz journey that has been fuelled by many visits to GippsTech Conferences each July in Churchill, Victoria.

If you have been considering attending a GippsTech Conference, then why not give it a go. It is two days of wonderful presentations and networking with the VK movers and shakers in microwave experimentation. It is well worth the visit and heaven forbid – you might even learn something or at least buy something!

Hope to see you there – when they resume; this July?

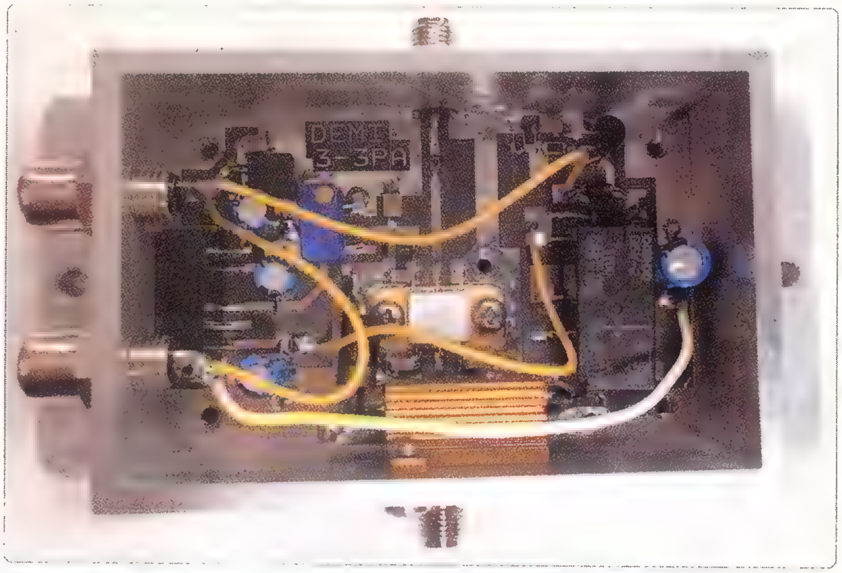
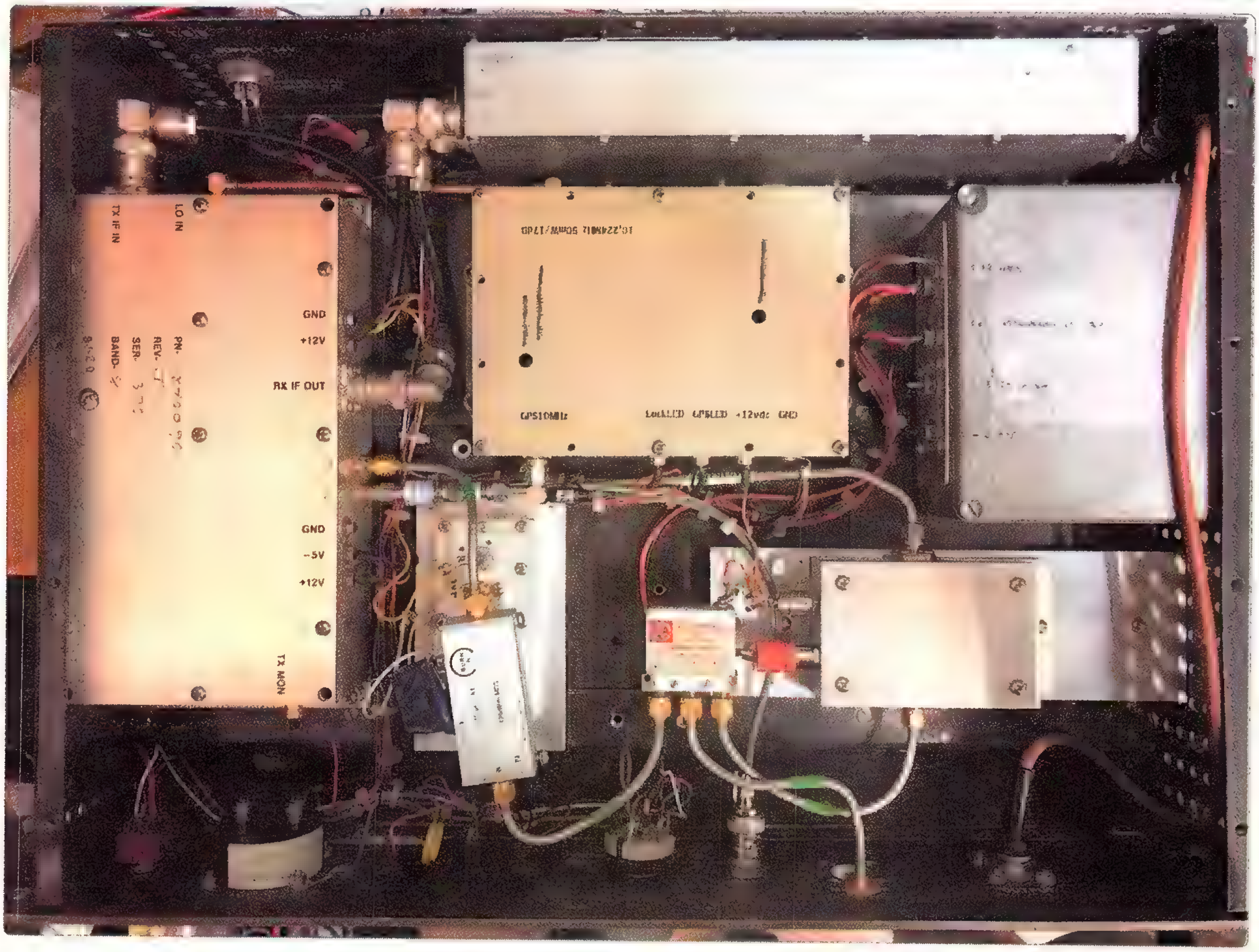


Photo 5. The completed 10 GHz power amplifier ready for testing.

Photo 6. The VK7TW White Box now



Curious antenna coupler has no variable capacitor

Peter Parker VK3YE

This simple antenna coupling unit (ACU) for low-power operation (QRP) exploits a double-sided circuit board off-cut or scrap to make a set of capacitors that can be chosen with links to work with a coil wound on a scrap tube of cardboard or plastic conduit.

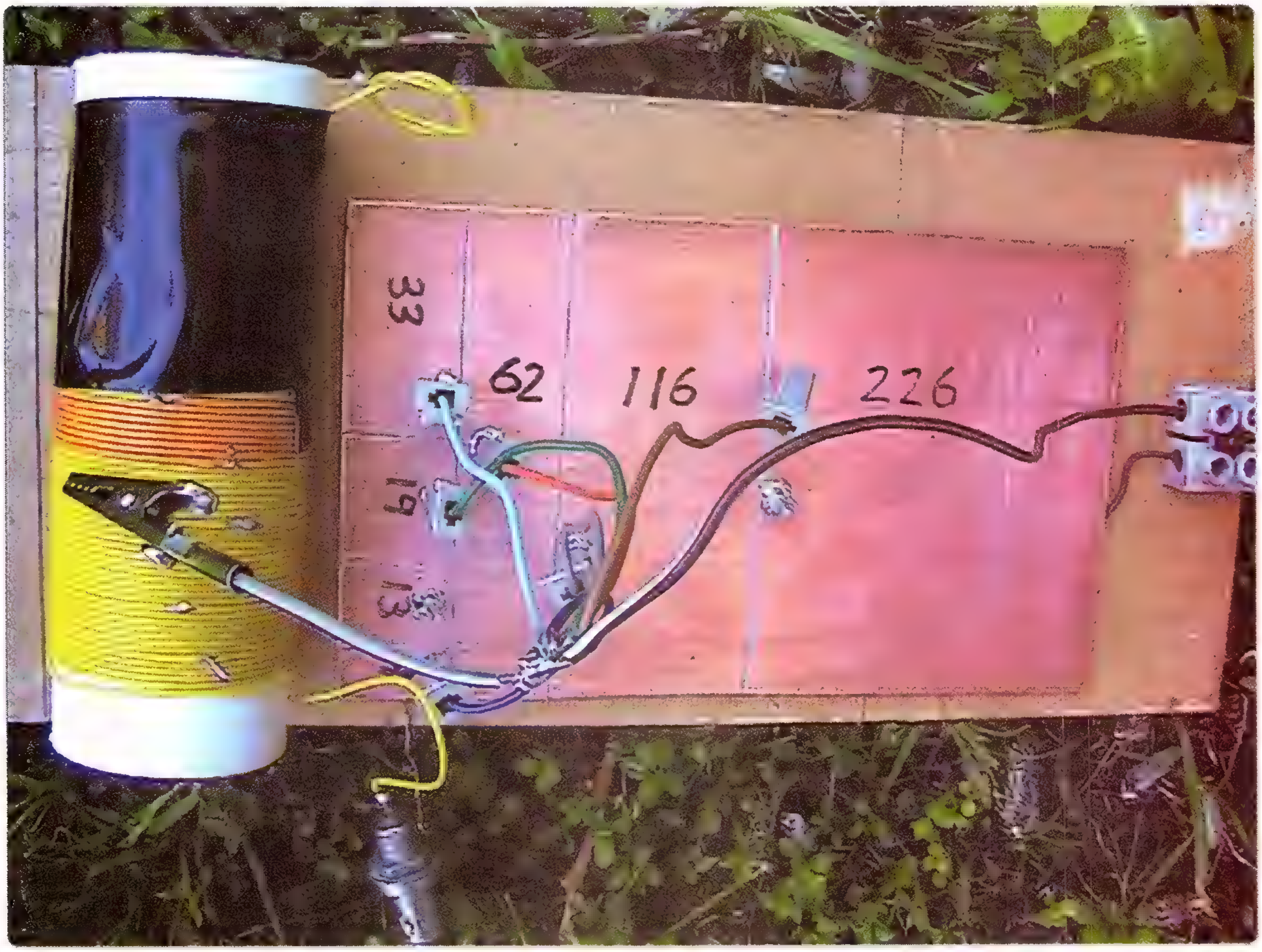


Photo 1: Yes. I know. But it works! Heath Robinson rules, OK?

Some amateurs shy away from antenna coupling units, but when it comes to operating an end-fed wire efficiently on multiple bands there are few substitutes. Sure, you can do clever things with ferrite transformers but coverage of some bands will be missed. And multiband coverage is desirable, especially as the solar cycle advances.

A link dipole is one solution for the antenna. Its performance is incontestably good. But you must lower it to change bands. And it is awkward when you use it on four or more bands because of the number of wire breaks needed. The coaxial feedline also adds unwanted weight to a portable station.

Design considerations

This brings us back to end-fed wires and antenna coupling units, the simplest of which is the L-match. This needs just two parts; an inductor and a capacitor. Both must be variable to allow transformation from the transceiver's 50 Ohm to a wide range of potential antenna impedances on multiple frequencies.

In practice, a slight compromise is common; the capacitor is made fully variable while the inductance has six to ten fixed values selected by a rotary switch. If you're too poor to afford an enclosed box and chunky rotary switch, or just prefer 'al fresco' construction on a timber board, an alligator clip on a lead to select the right coil tap can work fine.

Component Selection

First, the inductor

Needing just insulated wire and a cylinder to wind it on, all parts for the coil are commonly available. If your shed fails to produce a suitable diameter of plastic conduit (30-40 mm – not critical), raid the kitchen for what aluminium foil or food wrap comes on. Or, if that fails, you will find inspiration in the smallest room of the house. Gaffer tape or similar (or even epoxy varnish – Ed) can stiffen the coil former if yours is cardboard.

The coil is not critical. I used about 40 turns of thin insulated wire close-wound on a section of 40 mm diameter pipe. There are taps every five to seven turns, with an alligator clip to make contact. Have a few more taps near the start of the coil if you value better matching ability above 10 MHz.

Second, the capacitor

With the coil sorted, the next problem is the 'variable' capacitor. Too many antenna coupling unit projects remain merely hopes because of problems people have in finding a capacitor, especially recently when COVID-19 has stopped all the hamfests and disrupted the usual circulation of junk (treasure! – Ed) between amateurs' shacks.

A defunct AM transistor radio can help if you're happy with a plastic dielectric capacitor. But with fewer around today than previously, you may prefer to keep yours intact. Other issues with transistor radio variable capacitors include their limited RF power handling capability and low maximum capacitance.

Then there's the homebrew option. Arrangements I considered included concentric soup cans, soft drink cans, sliding overlapping baking trays, giant compression trimmers, and more. I abandoned them all for one reason or another (mostly, laziness).

I then looked at what I was having for lunch. After all a capacitor is just a sandwich. The bread is the conductor while the filling is the dielectric. Capacitance increases either when the plates are bigger or pressed closer. And it's lower if the overlap is reduced.

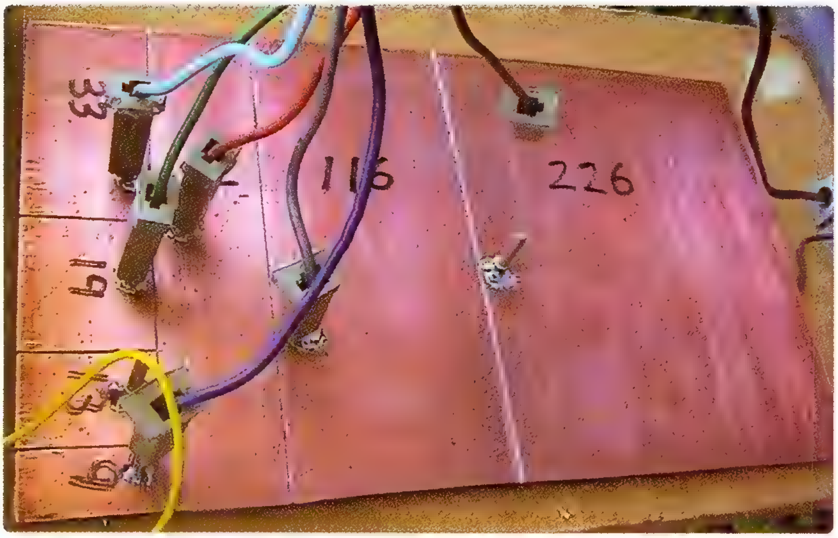


Photo 2: How to make multiple capacitors for almost nothing.

Another type of sandwich, more common in the ham shack, is double-sided blank printed circuit board material. I grabbed a 9 x 16 cm piece and measured the capacitance between the sides. It came to 450 pF. That's a perfect maximum for a homebrew antenna coupler! Fibreglass substrate material is preferred.

The next problem was how to make its capacitance variable. It does not have to be continuously variable, but the steps need to be close enough to permit fine adjustment for a range of antennas and frequencies.

The solution is digital binary. Recall how you can count to 31 with just one hand if you use a base-2 numbering system? In other words, two to the power of five (fingers) minus one?

You can do the same with a selection of switched capacitors to achieve the highest number of value combinations from the smallest number of parts. This is done in some commercial antenna coupling units.

The circuit board sandwich mentioned before can form the multiple capacitors needed. You just need to cut slots on one side so that, instead of a single 450 pF capacitance you have several of smaller values. These values should be double or half the values either side. Since capacitance is proportional to area of overlap you cut a progression of shrinking 'islands' until they get too small to bother with.

The first step is to split the copper on one side to half its size. A hobby knife or hacksaw is handy. Test with an ohmmeter to verify the islands are electrically separate. Use sandpaper to remove any burrs.

Testing with your capacitance meter (one probe on the underside, other probe on one of the top islands) will reveal that, instead of one 450 pF capacitor you have two capacitors of half that value. Connecting both in parallel will restore full capacitance.

This forms the basis of your switched variable capacitor. Saw another slot, dividing one of the islands in two. Then divide one of these smaller islands in two. This will give you four pads with a progression something like this: 220, 110, 55 and (again) 55 pF.

Extreme accuracy isn't important. But check for shorts if something is way out.

The above is a start, but finer adjustment is needed. Keep going by splitting the smallest strip. Go the other way so they get more square-like. Continue until you have seven islands with the lowest one measuring around 10 pF. Use a permanent marker to write the individual capacitance on each island.

Use circuit board pins or sockets, soldering one to each pad. Then make a cable harness with mating connectors. This allows you to connect one or more pads. You will have over 100 different combinations of capacitance. It's not continuously variable, but the steps should be fine enough, especially for the lower HF bands.

Using your new QRP ACU

Try various combinations of capacitor and coil for maximum noise on receive. Then, with a VSWR meter or resistive bridge, make any adjustments for lowest VSWR. This is the only real disadvantage of this coupler; band changing takes longer than if you could simply turn a variable capacitor. Still, you will soon get used to it, especially if you use the same length of wire each time for the antenna element and make a table of settings for bands you use most often.

In my experience, I was able to load up a 20-metre length of end-fed wire on the 160, 80, 40, 20 and 17 metre bands; 30 metres would also have been possible if I had extra coil taps or slightly adjusted the antenna wire's length.

Morse (CW) contacts and WSPR spots indicated good performance on the 40m and 20m bands. I would need to add length for full performance on 160m and 80m. Anything longer than about 3/8 wavelength long on the lowest operating frequency is a good starting point, but don't dismiss what 3/16 wavelength can do, especially if you've got a good ground system or even a tuned counterpoise.

Conclusion

If you want the multiband flexibility of an end-fed wire, but lack a suitable variable capacitor, then this circuit board capacitor can kick start the ACU project you've always wanted to build. A video demonstrating it appears on my YouTube channel, at: *youtube.com/vk3ye*

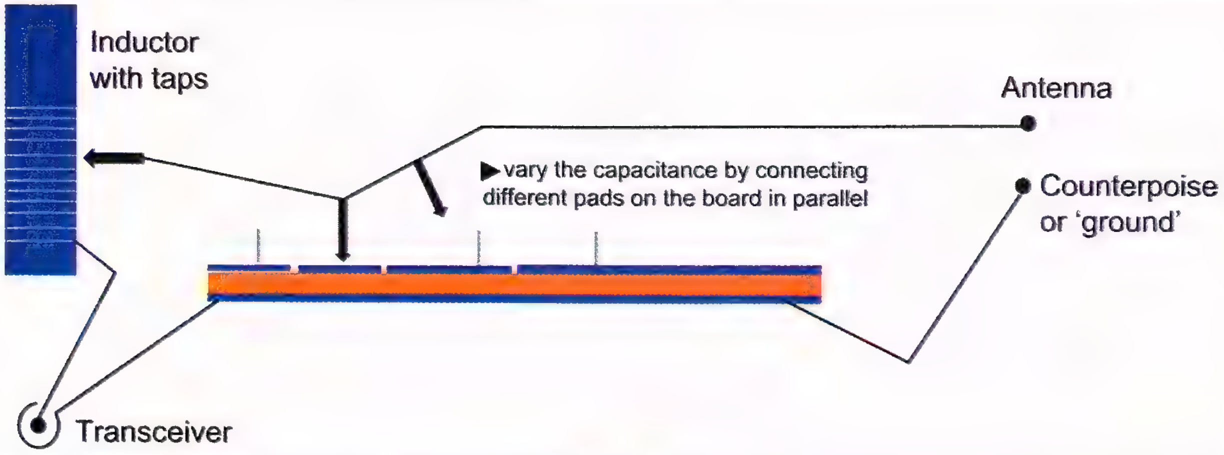

Inductor with taps
Antenna
▶vary the capacitance by connecting different pads on the board in parallel
Counterpoise or 'ground'
Transceiver

Figure 1: Wiring-up your low power antenna coupling unit (QRP ACU).

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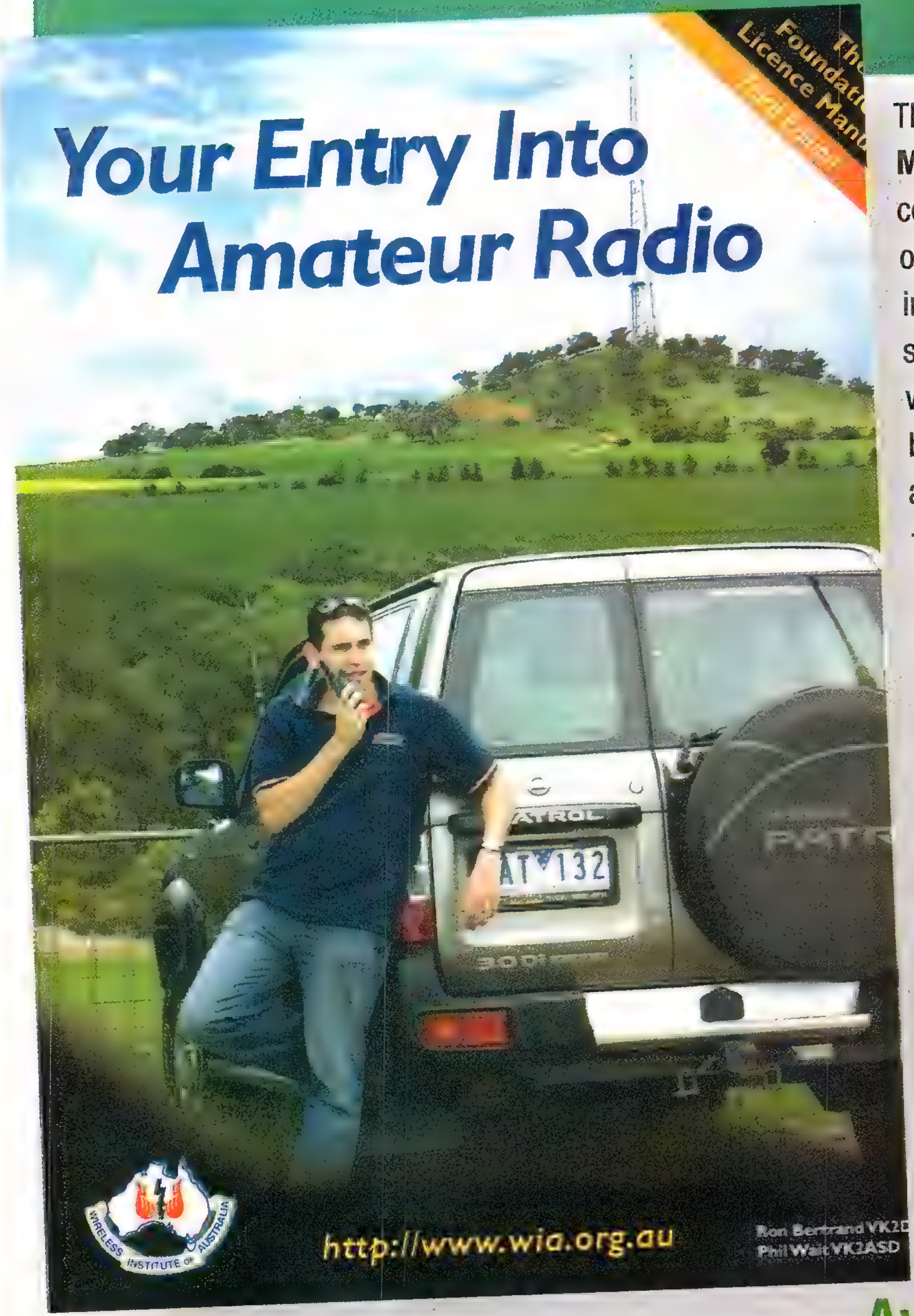
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WIRELESS INSTITUTE OF AUSTRALIA
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A different sort of COVID project

Escapade with a downed radiosonde

Peter Wolfenden VK3RV

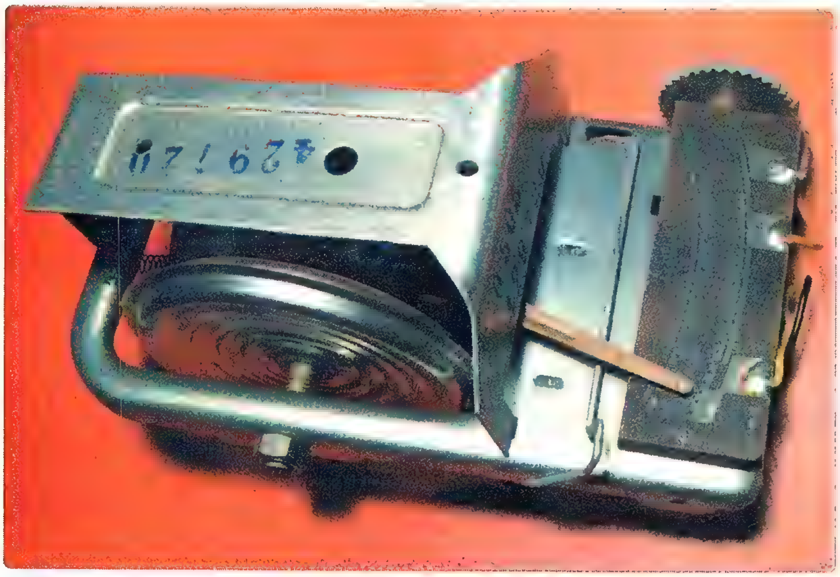


Photo 1: The height (pressure) sensor assembly. Note the circular aneroid pressure sensor; this mechanically drives the contact arm at right that sweeps the contact across the printed circuit arc, thus providing height measurement.

Sometime during the mid-1970s, I picked up a badly-damaged, small cardboard box in our back paddock; this paddock is normally occupied by a horse that was elsewhere at the time. The box had been partially torn open and there were signs of teeth marks in the cardboard. After I brought the remains back to the house, I found that it contained some electronic devices.

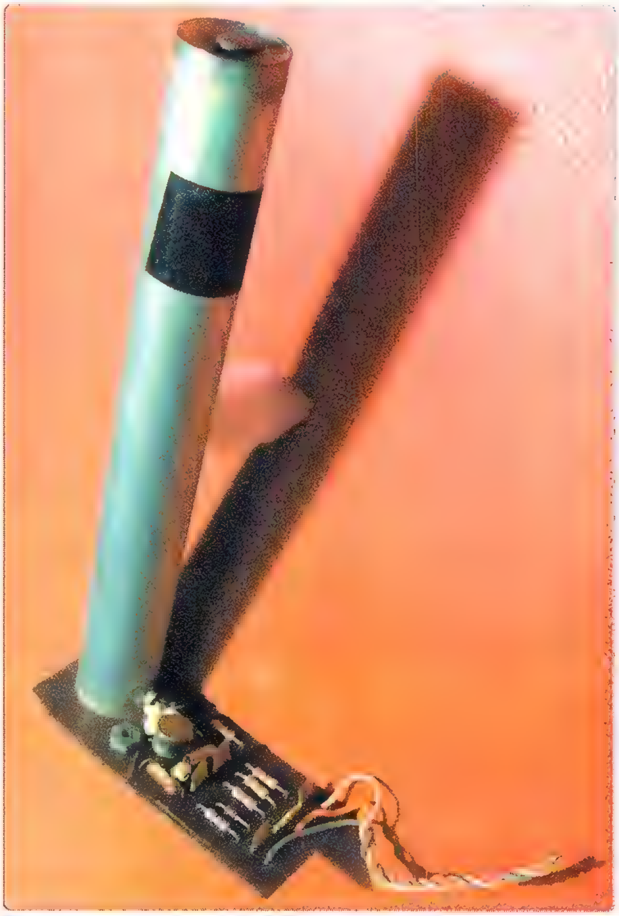
As it looked a little like the innards of an aneroid barometer suggested to me that this was the remains of a “radiosonde” from a weather balloon. The following weekend, I jumped the rural wire fence at our rear boundary into a much larger grazing property directly behind, and wandered about in the trees and scrub. In one tree I spotted the tangled remains of a balloon, cord and wire. This confirmed that what I found was in fact the remains of a radiosonde, dragged into our place by a dog or even a fox, which were plentiful around here in those days.

The July 2020 edition of *Radio Waves*, the journal of the Historical Radio Society of Australia, (a fine magazine), included an article by Rod Champness VK3UG and Ian Batty about radiosondes at Macquarie Island during 1967. It gave some detail about the earlier types based on valve circuitry, but the remains of the radiosonde I came across was a more modern version – definitely solid-state!

Recently, I went looking for the old bits that I knew I had stored ‘in a safe place’. I finally located the shoe box containing the remains and photographed them, after a necessary dusting! This became my so-called, COVID project!

Back in the 1970s, I was only interested in VHF and UHF and was immediately aware that this device must have been operating in the region of 400 MHz because of the length of a cavity resonator standing proudly off one of the printed circuit boards.

Photo 2: The radiosonde’s transmitter printed circuit board (PCB) featured a coaxial cavity resonator to set its transmitter frequency.



2N3866 (SILICON)
2N3866A

SOLID STATE INC.
46 FARRAND STREET
BLOOMFIELD, NEW JERSEY 07003
www.solidstateinc.com

CASE 79
(TO-39)

Collector connected to case

NPN silicon transistor, designed for amplifier, frequency-multiplier, or oscillator applications in military and industrial equipment. Suitable for uses as output, driver, or pre-driver stages in VHF and UHF equipment.

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter	V_{CEO}	30	Vdc
Collector-Base Voltage	V_{CB}	55	Vdc
Emitter-Base Voltage	V_{EB}	3.5	Vdc
Collector Current	I_C	0.4	Amp
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	5.0 28.6	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 5.0 mAdc, R_{BE} = 10 ohms)	BV_{CER}	55	–	–	Vdc
Collector-Emitter Sustaining Voltage (I_C = 5.0 mAdc, I_B = 0)	$BV_{CEO(sus)}$	30			Vdc
Collector-Base Breakdown Voltage (I_E = 0, I_C = 0.1 mAdc)	BV_{CBO}	55	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 0.1 mAdc, I_C = 0)	BV_{EBO}	3.5	–	–	Vdc
Collector Cutoff Current (V_{CE} = 28 Vdc, I_B = 0)	I_{CEO}	–	–	20	µA
Collector Cutoff Current (V_{CE} = 55 Vdc, V_{BE} = 1.5 Vdc)	I_{CEX}	–		100	µAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.36 Adc, V_{CE} = 5.0 Vdc) (I_C = 0.05 Adc, V_{CE} = 5.0 Vdc) 2N3866 (I_C = 50 mAdc, V_{CE} = 5.0 Vdc) 2N3866A	h_{FE}	5.0 10 25	– – –	- 200 200	
Collector-Emitter Saturation Voltage (I_C = 100 mAdc, I_B = 20 mAdc)	$V_{CE(sat)}$	-	–	1.0	Vdc
DYNAMIC CHARACTERISTICS					
Current-Gain – Bandwidth Product (I_C = 50 mAdc, V_{CE} = 15 Vdc, f = 200 MHz) 2N3866 2N3866A	f_T	500 800	800 –	– –	MHz
Output Capacitance (V_{CB} = 30 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	2.0	3.0	pF
FUNCTIONAL TEST					
Power Gain — Test Circuit-Figure 1, P_{in} = 0.1 W, V_{CE} = 28 Vdc, f = 400 MHz, T_C = 25°C	G_{pe}	10	–	–	dB
Power Output	P_{out}	1.0	–	–	Watts
Collector Efficiency	η	45			%

2N3866, 2N3866A (continued)

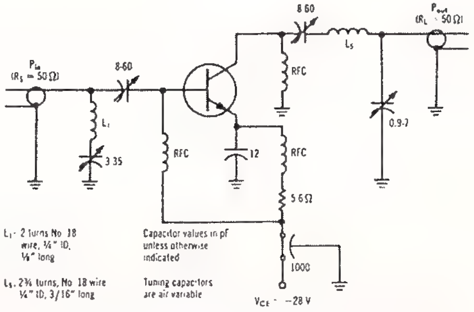

8 60
P_{out} (R_L = 50 Ω)
P_{in} (R_S = 50 Ω)
8-60
L_5
RFC
L_1
3 35
RFC
12
RFC
0.9-7
5 6 Ω
L_1 - 2 turns No 18 wire, 1/4" ID, 1/4" long
L_5, 2 3/4 turns, No 18 wire 1/4" ID, 3/16" long
Capacitor values in pf unless otherwise indicated
Tuning capacitors are air variable
1000
V_{CE} = –28 V

FIGURE 1 — 400 MHz RF AMPLIFIER CIRCUIT FOR POWER-OUTPUT TEST

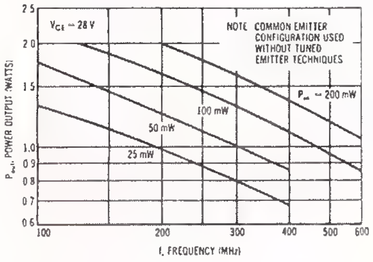


FIGURE 2 — POWER OUTPUT versus FREQUENCY (Class C)

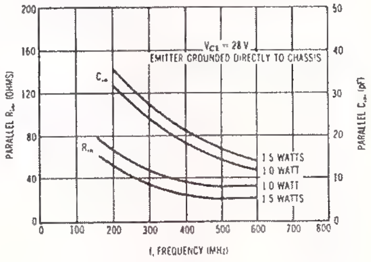


FIGURE 4 — PARALLEL INPUT RESISTANCE AND CAPACITANCE versus FREQUENCY (Class C)

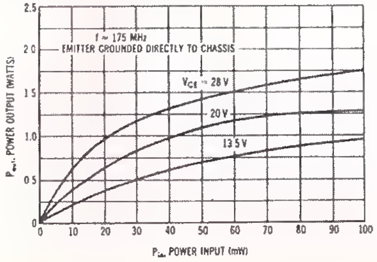


FIGURE 3 — POWER OUTPUT versus POWER INPUT (Class C)

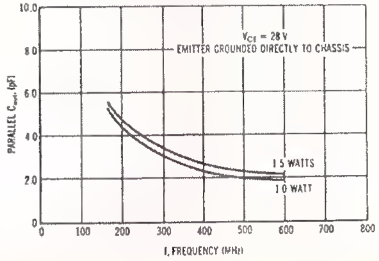


FIGURE 5 — PARALLEL OUTPUT CAPACITANCE versus FREQUENCY (Class C)

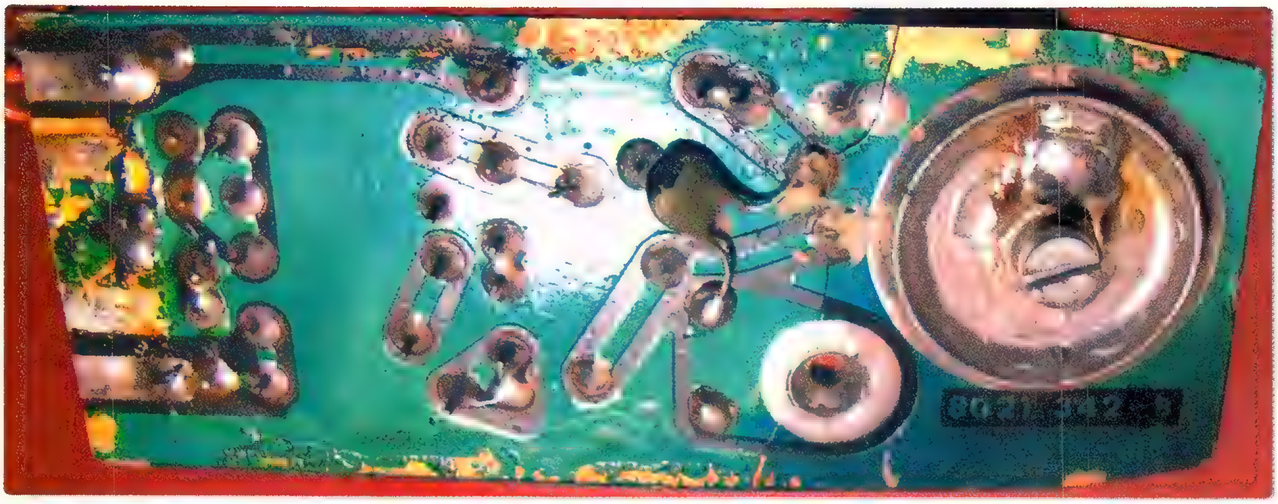


Photo 3: Showing the underside of the transmitter PCB. Note the cavity tuning screw and the prominent impact crack right across the board at the right hand side.

How dare they infringe on our 70cm band! Calculations proved the point and I now know that it operated on or about 402 MHz. (At that time I was playing ATV close by on 426 MHz).

The transmitter printed circuit board measured 30 mm wide by 70 mm long and had a crack running right across it, presumably caused by the collision with ground after it fell following the balloon burst, or perhaps from an over-anxious dog hopefully looking for a bone to chew in this strange looking cardboard box he had come across!

On the transmitter board, at the base of the tuning cavity, was a single 2N3866 and a small handful of standard components. That was the complete transmitter!

It was a free-running oscillator with its frequency controlled by the coaxial cavity and set by a tuning screw on the underside of the PCB, beneath the cavity. The output was coupled to a fixed mounting nut / antenna connector by a 1 pF capacitor. Three wires connected it to the control board, presumably for the DC supply and a modulation signal.

The 2N3866 was among the first VHF 'power' transistors to become readily available to home constructors – including me. The principle pages of the data sheet are reproduced here on page 34.

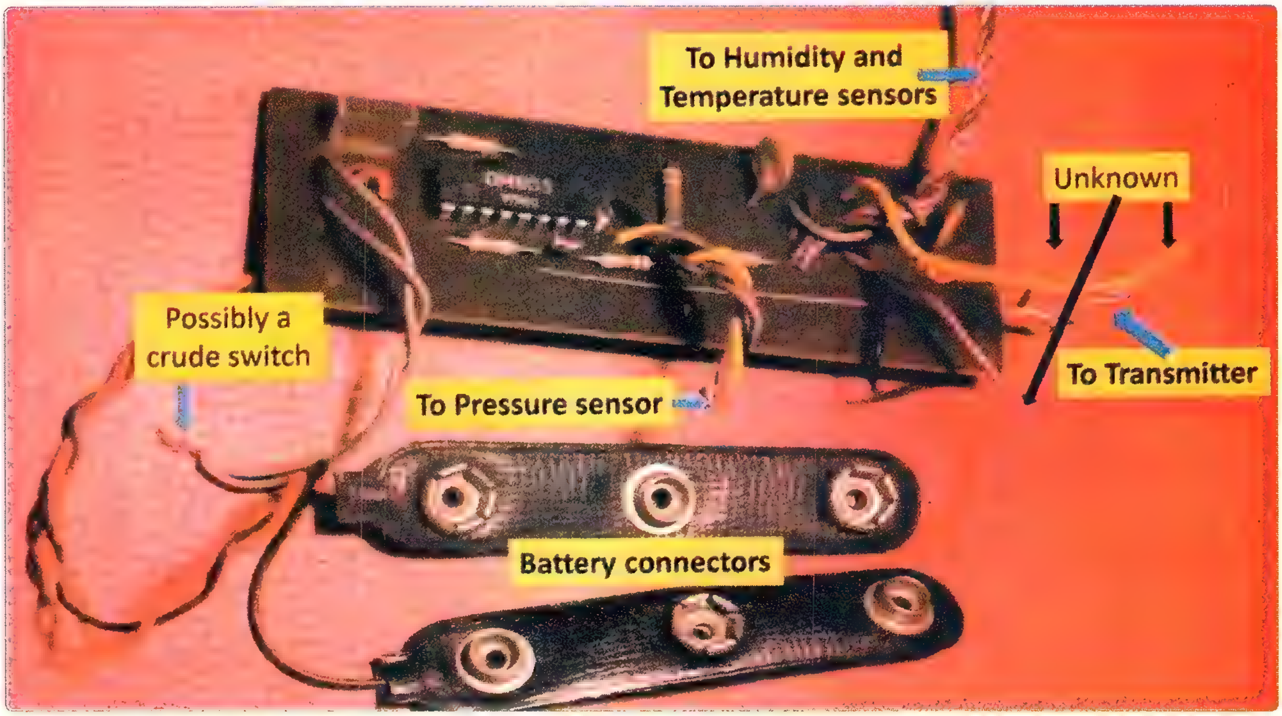
Photo 4: Air moisture (humidity) sensor and remains of the radiosonde box.

The most curious device (strange, even) in the box – see Photo 4 – was a strip of glass 95 mm long by 18 mm wide that was coated with a clear substance and clipped in place by its edges, each being coated in resistive / conductive strips. This was presumably some sort of air moisture or relative humidity sensing device.

Photo 5 shows a hinged, two-piece plastic assembly, overall size about 100 mm by 150 mm. The larger central section originally had the aneroid barometric device screwed to it. The other hinged section holds a broken temperature sensing element – a 50 mm-long thermistor. My recollection is that this device was swung up and away from the pressure sensing device, probably into an area with an open air flow, hence the need for a hinged assembly.

Photo 5: The height sensor mount and temperature sensor (at the top) – which is broken; perhaps another casualty from the sudden stop when the radiosonde reached the ground.

Photo 6: The control board is another simple assembly. The OM803 seems to be a no longer extant IC.



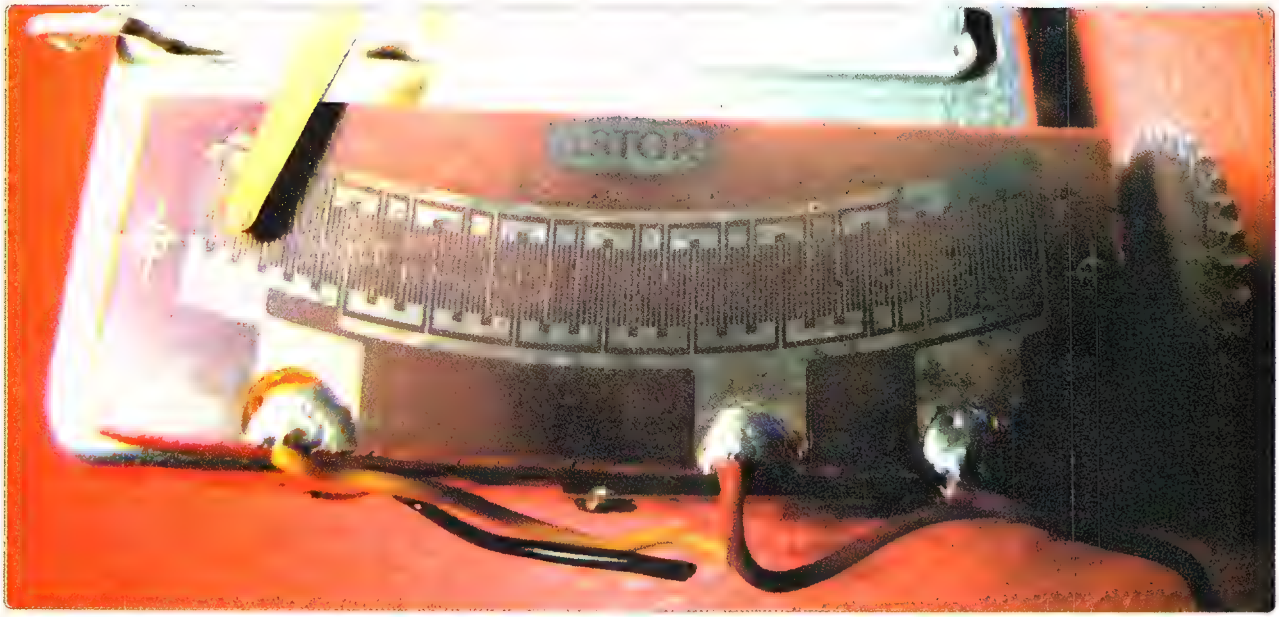


Photo 7: Note the prominent ASTOR logo on the pressure (height) sensor PCB.

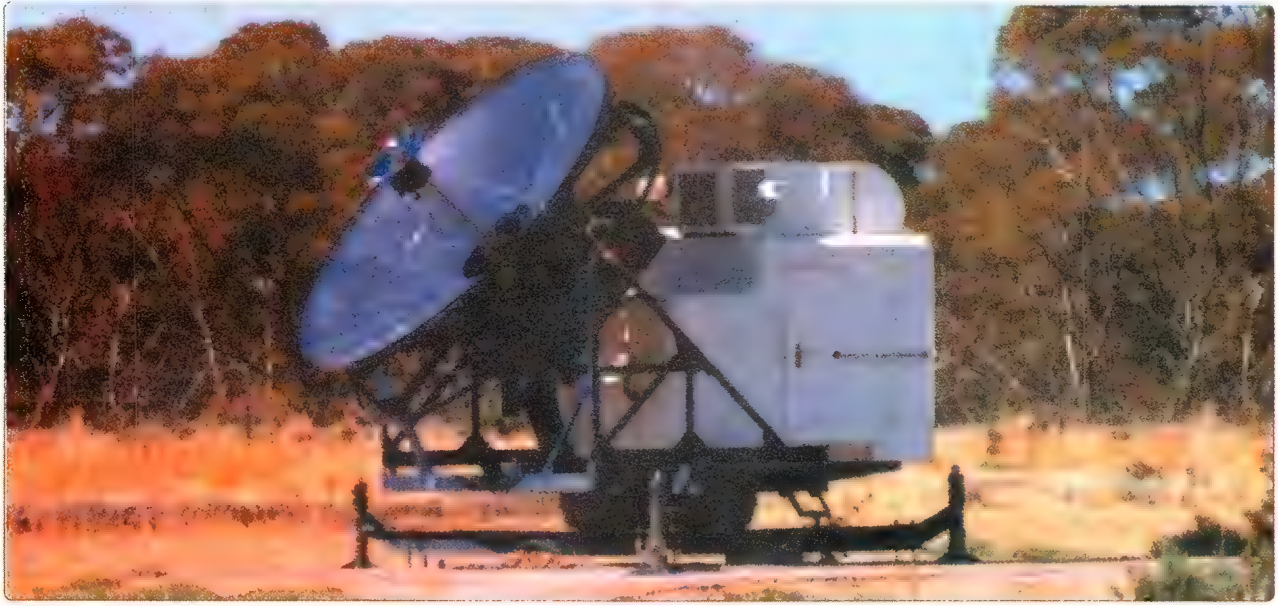
Photo 6 is of the control board, sequencer / timer, measuring about 100 mm by 32 mm, along with the battery clips. The single IC seems to be the complete controller and modulator, as there is no other board remaining in my collection from 'the box'. The battery clips are much larger than the common 9 V battery clips.

This photograph has been 'doctored' to make the barometric height measuring device sensor's etched contacts clearer. It also displays the brand name *ASTOR*, owned by Electronic Industries Limited (EIL).

EIL was a substantial company, based in Melbourne, that manufactured a large range of electronic devices, including radios, TVs, military equipment, (particularly during WWII) and government and other contract equipment, as well as a range of general home appliances, such as refrigerators and bicycles!

'My' radiosonde could well have been launched from Melbourne's Tullamarine Airport – about 25 km south of me.

Photo 8: This Bureau of Meteorology microwave radar (typical of the period) was used to track balloon-borne radiosondes by means of a triangular corner reflector dangling below the balloon that ensures a strong radar return and thus optimal reception of the 'sonde data signal from the correct direction. This particular installation was at Mildura Airport. (Photo circa 1983, by Damien Vale VK3RX).



VHF/UHF - An Expanding World

David K Minchin VK5KK

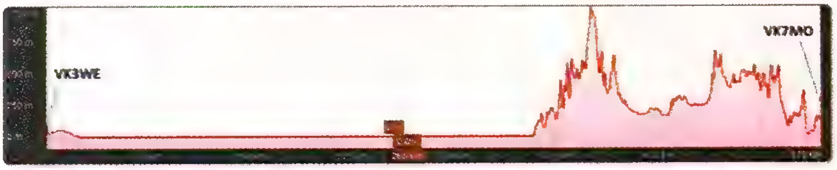


Figure 1. Take-off angles: zero degrees at VK3WE and 1 degree at VK7MO

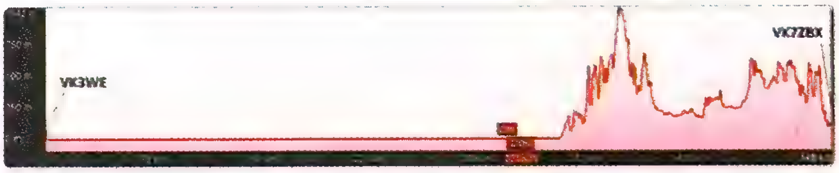


Figure 2. Take-off angles: zero degrees at VK3WE and 3.6 degrees at VK7ZBX.

In this edition, I will hand over to Rex VK7MO to present both parts of his report on the new WSJTX Q65 mode and the first VK7 to ZL contact on 10 GHz. The next part in the construction series (PLL references) has been held over to next issue as it will take up some room. The last issue's 10 MHz OCXO article has been very popular, we are on the second production batch of "Red" PCBs!

10 GHz terrestrial with Q65

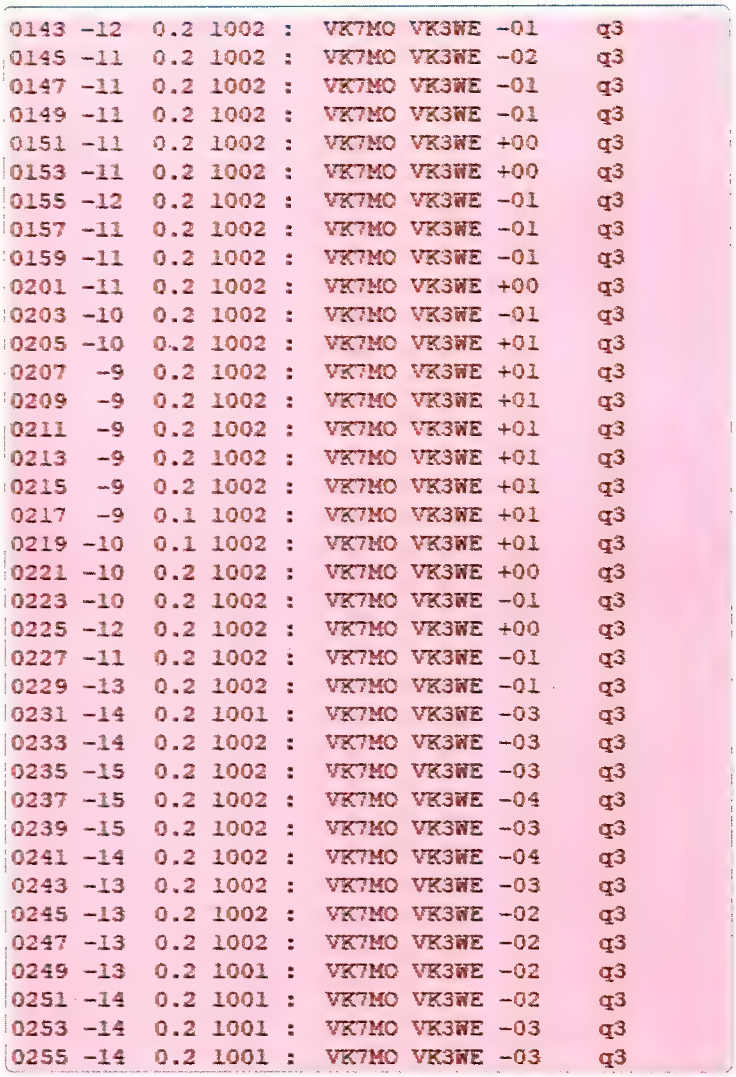
Q65 is a new mode that is available on the WSJT-X website as a Beta Version 2.4.0 rc-1. Almost overnight, Q65 has replaced QRA64 as the preferred digital mode for EME, even though it is only a release candidate that will expire on 27/4/2021! The following report has been prepared in two parts by Rex Moncur VK7MO, Roger Corbett ZL3RC, Rhett Donnan VK3WE, and Richard Howlett VK7ZBX.

Part 1 relates to testing Q65 over some two months on obstructed paths of over 550 km where it works extremely well and reliably on both troposcatter and forward-rain-scatter between small stations. Part 2 relates to the use of Q65 for tropoducting on a rare opening to complete the first ever 10 GHz terrestrial QSO between Tasmania and New Zealand over a distance of 1960 km.

PART 1

Testing Q65

The WSJT-X development team kindly invited us to take part in testing Q65. In some 50 tests over about 2 months it was possible to reliably complete QSOs over



```
0143 -12  0.2 1002 :  VK7MO VK3WE -01     q3
0145 -11  0.2 1002 :  VK7MO VK3WE -02     q3
0147 -11  0.2 1002 :  VK7MO VK3WE -01     q3
0149 -11  0.2 1002 :  VK7MO VK3WE -01     q3
0151 -11  0.2 1002 :  VK7MO VK3WE +00     q3
0153 -11  0.2 1002 :  VK7MO VK3WE +00     q3
0155 -12  0.2 1002 :  VK7MO VK3WE -01     q3
0157 -11  0.2 1002 :  VK7MO VK3WE -01     q3
0159 -11  0.2 1002 :  VK7MO VK3WE -01     q3
0201 -11  0.2 1002 :  VK7MO VK3WE +00     q3
0203 -10  0.2 1002 :  VK7MO VK3WE -01     q3
0205 -10  0.2 1002 :  VK7MO VK3WE +01     q3
0207  -9  0.2 1002 :  VK7MO VK3WE +01     q3
0209  -9  0.2 1002 :  VK7MO VK3WE +01     q3
0211  -9  0.2 1002 :  VK7MO VK3WE +01     q3
0213  -9  0.2 1002 :  VK7MO VK3WE +01     q3
0215  -9  0.2 1002 :  VK7MO VK3WE +01     q3
0217  -9  0.1 1002 :  VK7MO VK3WE +01     q3
0219 -10  0.1 1002 :  VK7MO VK3WE +01     q3
0221 -10  0.2 1002 :  VK7MO VK3WE +00     q3
0223 -10  0.2 1002 :  VK7MO VK3WE -01     q3
0225 -12  0.2 1002 :  VK7MO VK3WE +00     q3
0227 -11  0.2 1002 :  VK7MO VK3WE -01     q3
0229 -13  0.2 1002 :  VK7MO VK3WE -01     q3
0231 -14  0.2 1001 :  VK7MO VK3WE -03     q3
0233 -14  0.2 1002 :  VK7MO VK3WE -03     q3
0235 -15  0.2 1002 :  VK7MO VK3WE -03     q3
0237 -15  0.2 1002 :  VK7MO VK3WE -04     q3
0239 -15  0.2 1002 :  VK7MO VK3WE -03     q3
0241 -14  0.2 1002 :  VK7MO VK3WE -04     q3
0243 -13  0.2 1002 :  VK7MO VK3WE -03     q3
0245 -13  0.2 1002 :  VK7MO VK3WE -02     q3
0247 -13  0.2 1002 :  VK7MO VK3WE -02     q3
0249 -13  0.2 1001 :  VK7MO VK3WE -02     q3
0251 -14  0.2 1001 :  VK7MO VK3WE -02     q3
0253 -14  0.2 1001 :  VK7MO VK3WE -03     q3
0255 -14  0.2 1001 :  VK7MO VK3WE -03     q3
```

Figure 3. Example of rainscatter producing consistent decodes at VK7MO from VK3WE's 10 watts.

obstructed paths of over 550 km on most days only interrupted on 3 days when a strong duct was present and cut off the signal.

Equipment and Paths

VK3WE: 10 Watts to 60 cm dish, VK7MO: 90 Watts to 113 cm dish, and VK7ZBX: 30 Watts to 60 cm dish. All stations GPS locked to within a few Hz at 10 GHz using double oven GPSDOs.

Troposcatter

VK3WE's 10 watts generally produces S/N ratios in the range of -20 to -25 dB at VK7MO but nothing at VK7ZBX due, we assume, to his much poorer take-off. As expected, VK7MO's 90 watts is received about 10 dB stronger by VK3WE. Spreading is in the range of 10 to 35 Hz.

Forward-rain-scatter

The traditional method of operating rain-scatter is to use CW and for both stations to beam at a storm cell. This method produces large Doppler shifts and spreading. With the additional sensitivity of Q65, it is possible to use forward-rain-scatter from even the lightest rain. An advantage of forward-rain-scatter is that both the Doppler shifts and Doppler spreading are significantly reduced and spreading is similar to that for troposcatter. Doppler shifts are generally no more than a few Hz. Another significant advantage of forward-rain-scatter is that stations do not need to track storm cells but just beam at each other. One might think that rain might produce highly variable signals as rain cells cross the path, but in practice, we find that rain produces very consistent decodes as shown in Figure 3.

3WE's 10 watts and it is sometimes difficult to decide if propagation is due to rain-scatter or troposcatter. Moderate rain (Figure 4) produces much stronger signals up to -5 dB from VK3WE's 10 watts and +5 dB from VK7MO's 90 watts. Figure 5 shows the reported S/N as bands of rain cross the propagation path, such as shown in Figure 4 (from the Australian Bureau of Meteorology Rain Radar at: *www.bom.gov.au/products/IDR521.loop.shtml#skip).*

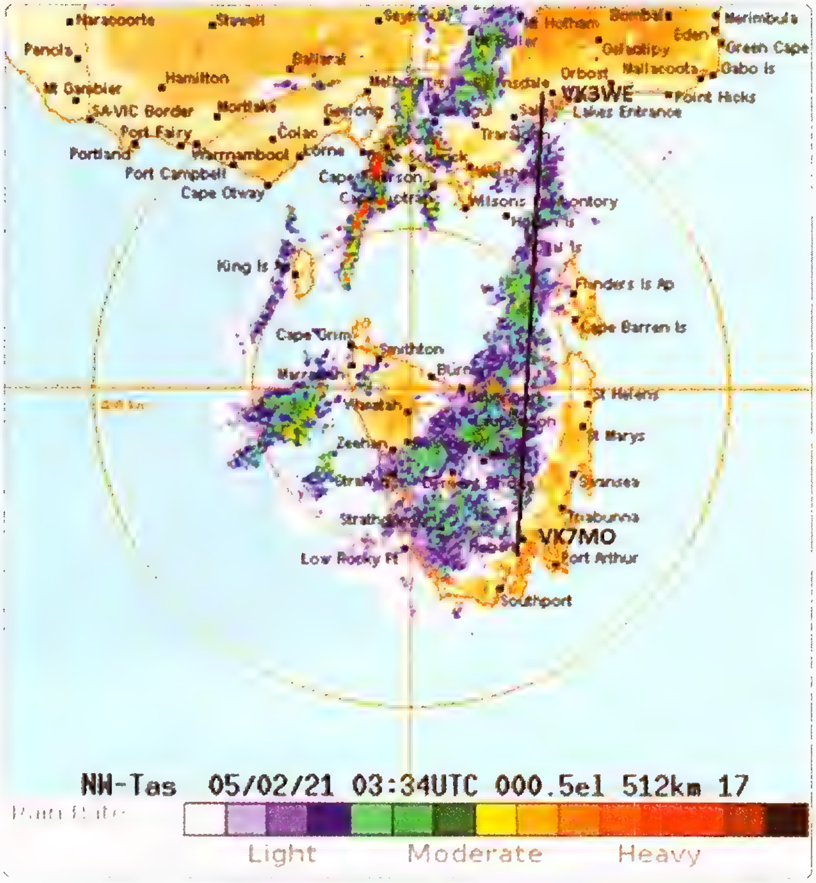


Figure 4. Band of moderate rain producing strong and consistent signals, as shown in Figure 3.

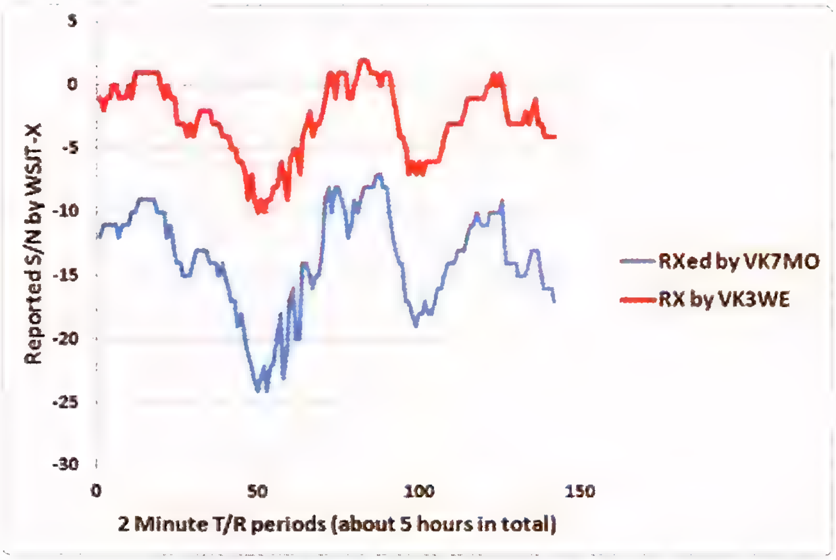


Figure 5. Example of S/N over some five hours as bands of rain pass between VK7MO and VK3WE, such as shown in Figure 4.

In the case of VK7ZBX, he has completed QSOs on three occasions when there was moderate rain on the rain radar and only when the rain was nearer his end. This seems to be a function of his poor take-off. Nevertheless, VK7ZBX was extremely excited to complete his first 10 GHz QSOs to the Australian mainland!

Tropoducting on the obstructed path

We have not completed a QSO now on three out of some 50 occasions; on each occasion, a strong duct was present on the Melbourne radiosonde data. On only one of these occasions was it not possible for VK3WE to decode signals from VK7MO's 90 watts. We think there are three situations with ducting:

1. No propagation at all when a duct was at around 900 metres and below the obstructions on the path.
2. Weak propagation when there is a strong, high-level duct above the obstructions on the path that prevents VK7MO entering the duct due his 1-degree take-off. But this does allow a weak troposcatter signal in the limited area below the duct – sufficient for VK3WE to receive VK7MO's 90 watts, but not the reverse.
3. A strong, high-level duct at VK3WE's end that does not continue all the way to VK7MO. We have seen one example of this that produces a stronger signal than troposcatter and allows an easy two-way QSO.

It is early days, and we have few examples but Q65 does provide the opportunity to study some of the issues with ducting.

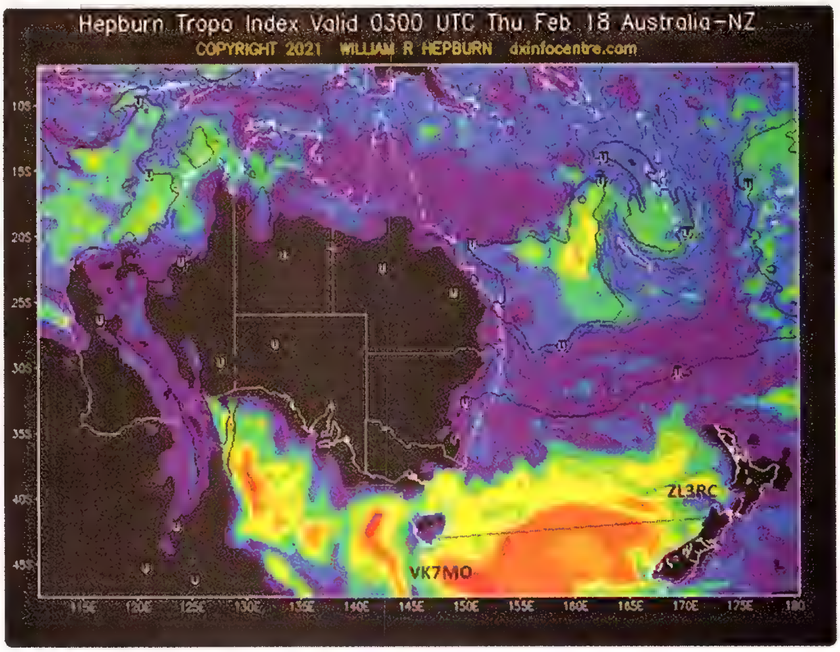

Hepburn Tropo Index Valid 0300 UTC Thu Feb 18 Australia-NZ
COPYRIGHT 2021 WILLIAM R HEPBURN dxinfocentre.com
10S
15S
20S
25S
30S
35S
40S
45S
115E
120E
125E
130E
135E
140E
145E
150E
155E
160E
165E
170E
175E
180
ZL3RC
VK7MO

Figure 5 Hepburn chart showing the path between VK7MO and ZL3RC.

Q65 sub-modes and T/R periods

We generally use the Q65-60D sub-mode that has a T/R period of 60 seconds and a tone spacing of 13.3 Hz. On a few occasions when signals were weak due to high level ducts, we found that it was possible to achieve decodes by going to the 120 second periods. While we don't have hard data, it does seem that doubling the period produces the expected 3 dB improvement and can allow a QSO in difficult conditions.

We have tried Q65-60 in sub-modes A to E. There seems little difference between B, C and D, but A and E might be slightly behind.

Aircraft scatter interference

We have seen some examples of aircraft-scatter interference. Generally, if a decode fails due to aircraft scatter, this can be overcome by reducing *Ftol* to exclude the aircraft scatter signal if it has wide Doppler shift, such as from a crossing aircraft.

If the aircraft path is closely aligned to the path of propagation and Doppler shift is not more than 10 or 20 Hz, it has little effect on decoding. Subject to further testing, our view at this stage is that the D sub-mode with 13 Hz tone spacing, combined with Ftol of 20 Hz is the best setting to avoid the loss of decodes due to aircraft scatter interference.

Stations in Europe and North America have many more aircraft and it will be interesting to get their experience.

Conclusions to Part 1

Q65 is an excellent mode for both troposcatter and forward-rain-scatter at 10 GHz and is useful for 10-watt stations over at least 550 km on obstructed paths. The combination of rainscatter and troposcatter allows QSOs under most conditions only interrupted by occasional ducting on obstructed paths.

Obstruction angles of more than a few degrees require moderate rain that is closer to the station with the poorer take-off. We suggest using the Q65-60D mode for 10 GHz terrestrial contacts, but Q65-120D or E are well worth trying on longer or more difficult paths.

PART 2

Tropoducting over 1960 km VK7-ZL

In DUBUS 1/2020 Page 110, VK7MO and ZL3RC reported on the first 10 GHz Terrestrial QSOs from the Australian mainland to New Zealand. For those QSOs, VK7MO travelled some 1400 km North to latitude 31 degrees South so as to take advantage of more frequent ducting at these latitudes.

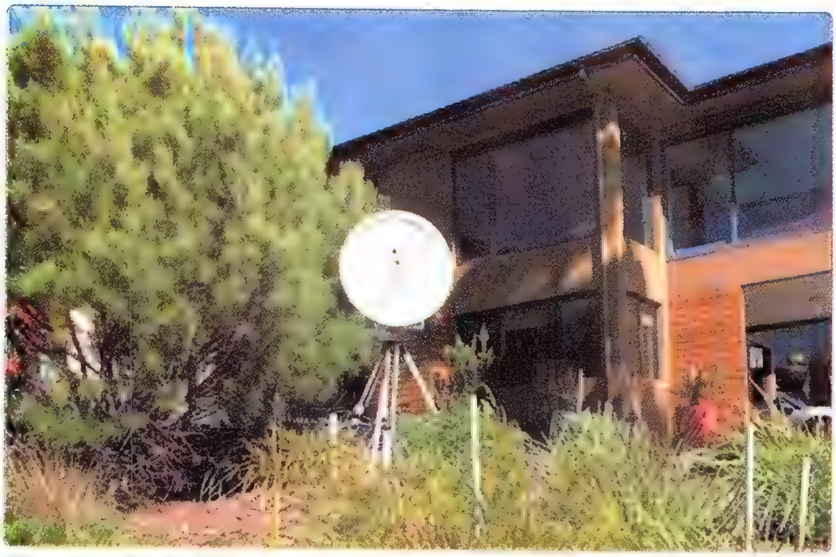


Figure 7. VK7MO's 77 cm dish set up in his neighbour's garden.

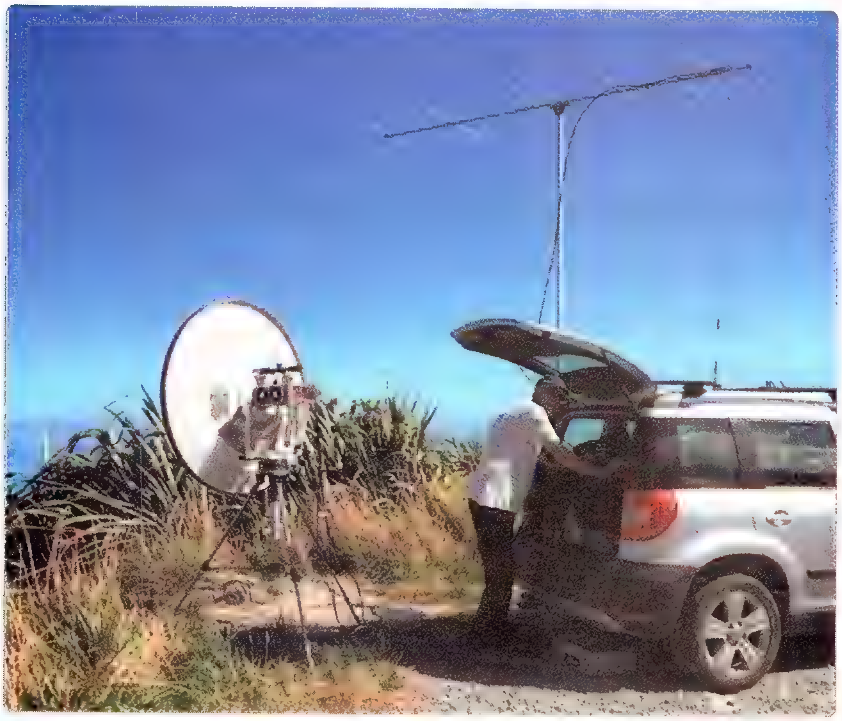


Figure 8. ZL3RC at his site about 15 km North of Greymouth using the petal dish that VK7MO left with him after the World Record [illegible] QSO with G3WDG (DUBUS 4/2018 page 115).

Ducts are very rare between VK7MO's home QTH in Tasmania at 43 degrees South and ZL3RC on the South Island of New Zealand. However, one of those rare ducting events did show up on the Hepburn Chart as depicted in Figure 6. Encouraged by the Hepburn chart, ZL3RC travelled from Christchurch to the West Coast of New Zealand early on the morning of Thursday 18 February 2021.

Equipment

VK7MO: 60 watts to 77 cm dish (Figure 7). This was set up in Rex's neighbour's garden and operated remotely back to his home so as to get a clear path between and above trees in ZL3RC's direction. ZL3RC: 60 watts to 113 cm (Figure 8).

As soon as ZL3RC arrived on the West Coast, he set up for 2m near Greymouth and confirmed good propagation with an SSB QSO on 2m. ZL3RC then travelled North to Charleston to his accommodation and in the afternoon checked out a site nearby, but signals were weaker on 2m. He then returned to the earlier site (Figure 8) by late afternoon and found 2m signals were still good and set up for 10 GHz. Almost immediately, Q65 tones were audible and a Q65-60D QSO was quickly completed (Figure 9).

Note in Figure 9 that ZL3RC still had his home grid locator showing, but after VK7MO sent text messages on Q65 to "CHECK YR GRID", ZL3RC responded with "OOPS" and corrected his Grid Locator. Thus, demonstrating the Q65 does allow other information than the bare minimum exchange!

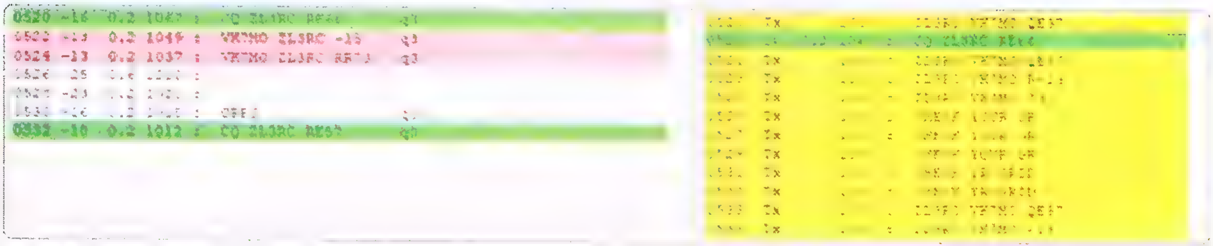


Figure 9. Initial QSO with Q65-60D.

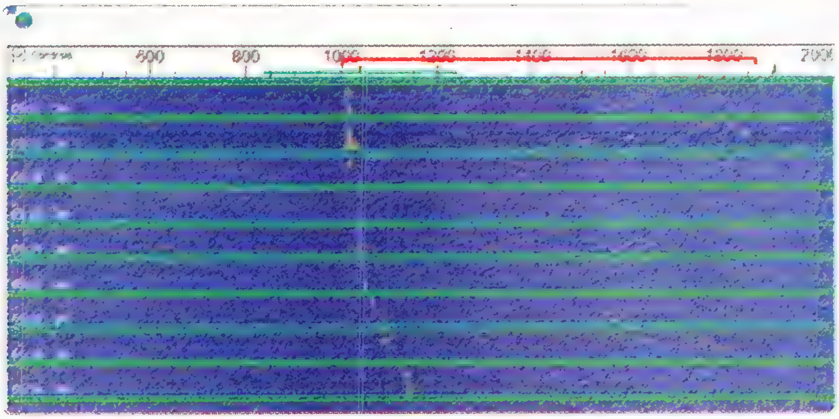


Figure 10. Drift on ZL3RC's GPSDO that took some time to stabilise but still Q65 60D decoded correctly.

ZL3RC had only just set up his GPSDO at the time of the initial QSO and it was drifting significantly as shown in Figure 10. At the start, drift was around 40 Hz per minute, but still Q65-60D decoded correctly.

Other Q65 T/R periods and tone spacings

Given the relatively good signal levels, we started sending text messages to try out Q65 modes with periods of 30 second and then 15 seconds. Q65-30D worked well and Q65-15C and B also worked, but because of their lower sensitivity, failed during QSB troughs. At one stage, Q65-15C decoded with a reported signal level of -1 dB at VK7MO (Figure 11).

An extract from the All.TXT file can be seen in Figure 11 that shows the RX and TX messages, the mode, T/R period and tone spacing (in this case Q65-15C), and the signal report (in this case, -1). The frequency in this case is the IF frequency of 144.2 MHz, but the operating frequency was 10,368.2.

When signals peaked at -1 dB, VK7MO sent the text message to try SSB (Figure 11). While callsigns were detected on SSB on peaks, it was not possible to complete an SSB contact even though we tried for some 20 minutes.

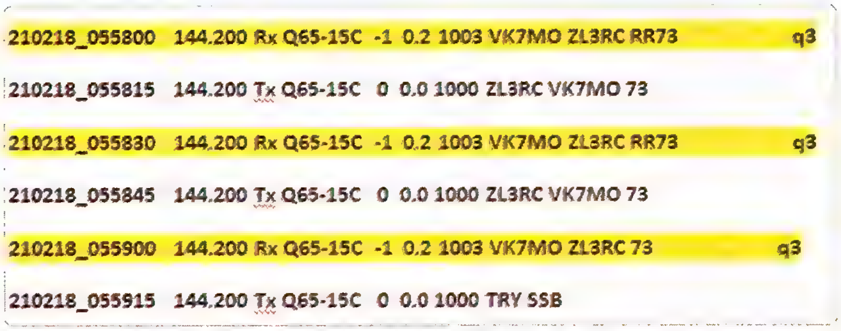
It is possible that signals faded, but is also seems that a characteristic of a 10 GHz troposcatter path is rapid fading on a time scale of a second or so. However, it does appear that Q65 copes well with such fading.

Spreading of Ducted Signals

As noted in Part 1, while 10 GHz rainscatter and troposcatter tends to spread in the range 10 to 35 Hz, we have previously noted that tropoducting has very little spreading. ZL3RC sent a single tone, as shown in Figure 12, and the spreading is no more than 2 Hz.

We did a number of tests with the Q65-60C mode which has a tone spacing of 6.6 Hz that worked well, and it is likely that the 60B mode with a tone spacing of 3.3 Hz would also work well and pick up around 2 dB to 3 dB on 60D. One caution is that, from other tests, strong tropoducting can sometimes be extended by troposcatter and then one would need to use the 60D tone spacing to accommodate the increased spreading the troposcatter component of the path would produce.

While there are some short bursts of energy up to 5 Hz either side, these are at least 10 dB down and should have no impact on Q65 decoding.



```
210218_055800   144.200 Rx Q65-15C  -1  0.2 1003 VK7MO ZL3RC RR73        q3
210218_055815   144.200 Tx Q65-15C   0  0.0 1000 ZL3RC VK7MO 73
210218_055830   144.200 Rx Q65-15C  -1  0.2 1003 VK7MO ZL3RC RR73        q3
210218_055845   144.200 Tx Q65-15C   0  0.0 1000 ZL3RC VK7MO 73
210218_055900   144.200 Rx Q65-15C  -1  0.2 1003 VK7MO ZL3RC 73         q3
210218_055915   144.200 Tx Q65-15C   0  0.0 1000 TRY SSB
```

Figure 11. Decodes in Q65-15C at -1 dB on the WSJT scale.

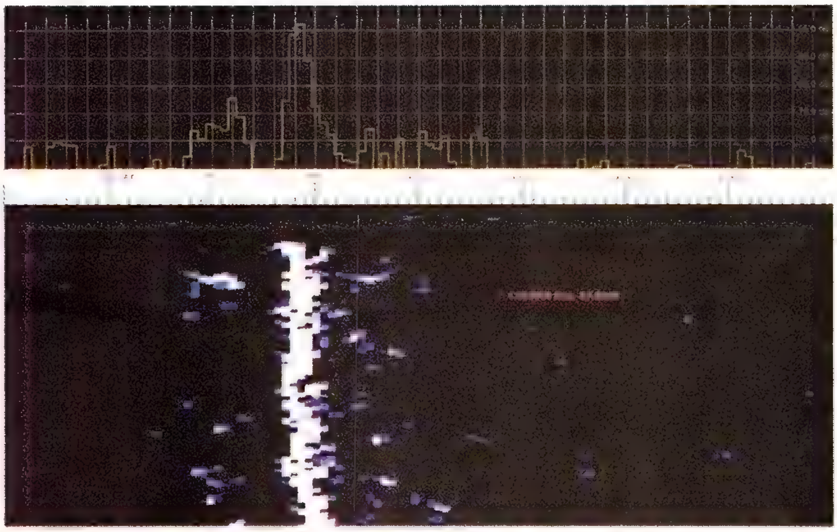


Figure 12. Single tone tropoducting test shows the bulk of the energy within 2 Hz.

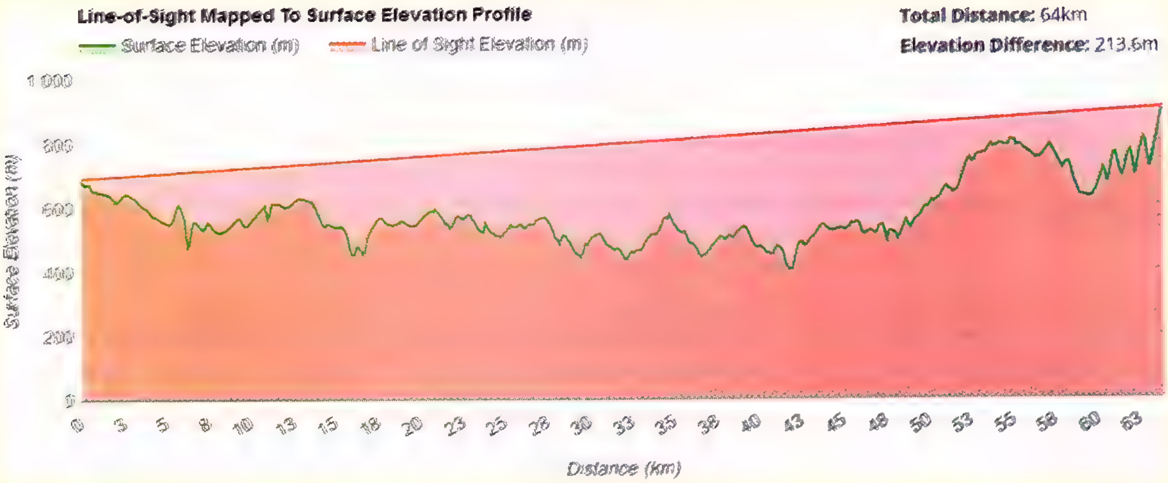
Matthias DK5NJ's 241 GHz rig used for the record – a part-built tri-band transverter design by DB6NT.

New distance record set on 241 GHz band

With favourable weather conditions prevailing for propagation on the millimetre-wave bands, Michael DB6NT and Matthias DK5NJ had a crack at setting a new DX record on 241 GHz, succeeding in making contact over 63.987 km.

At 1710 UTC, DK5NJ at Schwedenwache (locator JO50TI29JN), worked DB6NT at Aschberg in the Saxon-Czech border area (JO60GJ03MN), exchanging 599 signal reports. DK5NJ was 690 metres above mean sea level (AMSL), while DB6NT was 896 metres AMSL (an elevation difference of 206 metres). Relative humidity was 45% and the temperature -1° C.

The path was line-of-sight (see the path map below), enabling the antennas to be aligned using rifle scopes. With signal strength about 30 dB above the noise floor, it was thought that a distance of 100 km could have been achieved on the day.



For the first eight seconds or so, there is about 1 Hz of drift to the low side. Tests with VK3WE have shown that it is important to run GPSDOs off a separate power supply to that of the transmitter to avoid small voltage changes that can cause drift on GPSDOS at 10 GHz.

Ducting

Propagation was present on 10 GHz from the afternoon of the 18th to the afternoon of the 19th (February), and thus for at least 24 hours. While signals did peak at -1 dB much of the time, they were between -20 dB and -26 dB. Signal levels of -26 dB are about the limit of the Q65-60D mode. Figure 13 shows a strong duct at VK7MO's end on the 19th at around 1200 meters, which is well above VK7MO's location at 320 metres.

Conclusions to Part 2

Q65 is an excellent mode for tropoducting on 10 GHz. While

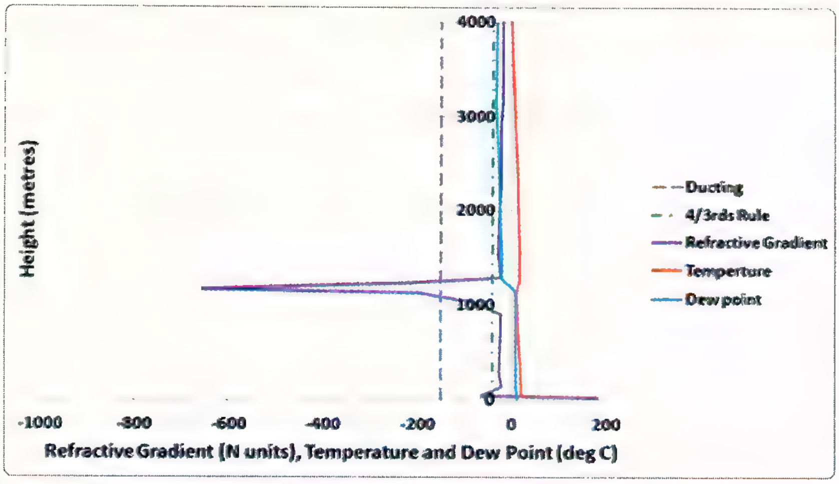


Figure 13. Strong duct at VK7MO's end, from radiosonde data.

Q65-60B is likely to give the best performance, Q65-60D is a safer option when the duct may not extend over the full path and troposcatter may be involved.

Q65 seems to cope well with the rapid, short-term (one second, or so) QSB that we found at times on this tropoducting path.

Acknowledgements

To Joe Taylor K1JT; Bill Somerville G4WJS; Steve Franke K9AN; and Nico Palermo IV3NWV, for producing Q65 – an amazing bit of work.

What happened 20 years ago..

Continuing in the series of what happened two decades ago, from my March 2001, column Ross VK2DVZ reports working Rex VK7MO on 70 cm for a new VK7 record, in the pre digital era.

"Thanks to Rex VK7MO portable at Mt Wellington for adding a new grid square to my 2m and 70cm tallies together with the new grid provided by Warren VK3BWT on 70 cm as well. Rex was over 1300 km from me, while Warren is about 682 km from me.

"His 2m signals varied from S1 to S7 during the time I was in the shack, until 2300 UTC, 17-2 2001. Rex's 70cm signals varied from S1 to S6, tending to drop out at times. Lots of QSB on both bands. 23cm was tried:- I heard the carrier from Rex's end & he heard my CW beacon. No contact was made. All the more reason to try again!

"Rex and I initially exchanged 5/3 reports both ways on 144.18 MHz and 5/4 reports both ways on 70cm. Warren and I exchanged 4/1 reports both ways on 70cm, whilst 2m reports were 5/3 sent and 5/4 received. Rex is able to claim a new VK7 distance record with our 70cm contact unless he managed to work further afield after I left the shack around 2300 UTC." . . . Ross VK2DVZ.

In closing

Feel free to drop me a line if you have something to report or a project you are working on, it doesn't take much to put a few lines together and helps with the diversity of this column. Just email me, at: *david@vk5kk.com*

73's

David VK5KK

Editorial

Continued from page 3

the colloquial name, advertised widely and heavily in the Dick Smith tradition he knew so well. A few years into the growth ramp-up of Jaycar, he bought Edge Electrix, another electronics retailer 'in the DSE mold'.

Gary also made a strategic alliance with Jack O'Donnell, proprietor of the Perth-based electronics retailer, Altronics (there's that DSE mold, again) to jointly import components and equipment – Perth being closer to South East Asia and thus having logistical advantages for importing electronics. The rest, as is said, became history.

Today, Jaycar has nearly 150 stores (including Road Tech Marine outlets) across Australia and New Zealand, employing almost 1000 people. Wisely, some while ago, Gary put in place a strong management team to run the business so he could step back, not only to enable the business to continue should he be "run over by a bus", but also to allow him to pursue his other interests outside electronics retailing – Gary was a long-term supporter and sponsor of NSW Rugby League team Wests Magpies, and also delighted in entering bush-bash charity events and such-like tomfoolery with a charity attached.

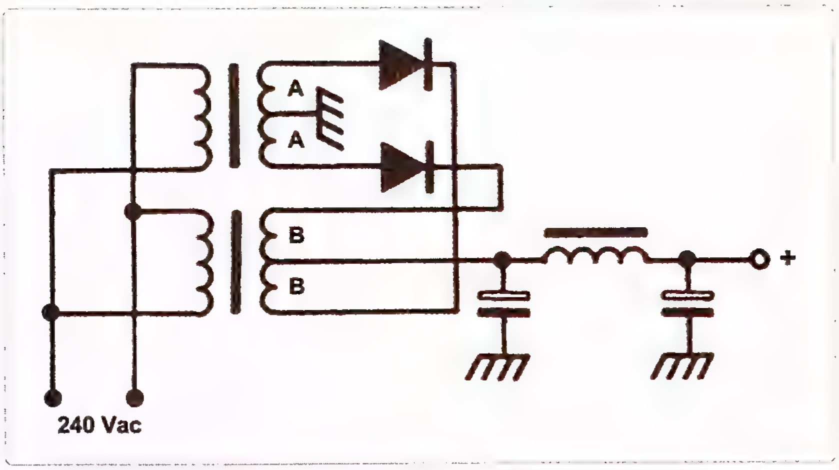
Gary was "a bloke's bloke". He liked to eat, drink, talk and joke with other blokes. But he equally enjoyed the company of women. He enjoyed a yarn and an argument. Beneath a gruff, blokey, hard-nosed, hyperactive businessman exterior lived a basically nice guy. He and I had our disagreements over the years, but Gary didn't hold grudges.

My condolences go out to his wife and family, the Jaycar crew that make the business what it is, his friends in the Wests Magpies and in other philanthropic interests, and his mates around the trade. Valé to a true character.

Bench NoteBook

Roger Harrison VK2ZRH

Power supply hack – boost it or buck it



Occasions arise when designing or rebuilding a power supply using a transformer at-hand that you can't get – or can't *quite* get – the DC voltage you need. Damn it, if only the transformer you have had a few extra turns on the secondary! Of course, in true hacker / homebrewer fashion, you could pull the trannie apart and wind on those extra turns. But, so often, examination of the trannie reveals just how impractical, or impossible, that would be – especially those with a centre-tapped secondary where the centre-tap join is 'inside' the transformer construction.

This circuit comes to your rescue, using an additional low voltage transformer and connecting them in series, phased so that the secondary voltages – A and B, here – add via the full-wave rectifier circuit, thus boosting the DC output voltage.

If you're in the predicament where the secondary of the transformer at-hand has higher output than you need or plan using, you can connect the other transformer in anti-phase to reduce – or 'buck' – the output voltage. In this case, A and B subtract, thus lowering the DC output voltage.

It's more convenient to set the phasing via the primary winding connections.

The transformer providing the A voltage should be the one with the lower voltage secondary, as the centre-tap is connected to the circuit 'common' (aka 'ground'). The transformer providing the higher voltage (B) will have (or should have) greater insulation breakdown ratings. The current capacity of each transformer should be selected or checked to meet the requirements.

The rectifier diodes should have peak inverse voltage ratings greater than the combined peak voltages of A and B.

While I have shown a pi-type DC smoothing circuit with a choke, it isn't essential.

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SOTA and Parks

Allen Harvie VK3ARH
e *vk3arh@wia.org.au*

Photo 1: The Hotham Crew, from left to right: Geoff VK3SG, Brian VK3BCM, Gerard VK2IO, Alan VK3AGS, Allen VK3ARH, Rik VK3EQ. Peter VK3PF, Chantel, Compton VK2HRX, Ken VK3KIM, John VK5HAA, Tony VK3CAT, Nan, Phil VK3BHR, Andrew VK1DA, and Glenn VK3YY.

5th Annual Hotham SOTA Summit weekend

This is normally an annual event. The previous year's event was postponed because of fires before being cancelled because of the COVID-19 virus. This year was touch and go for a while, with COVID-19 restrictions looming. However the timing was right and we were able to enjoy a weekend in the Victorian alpine region.

Again, Brian VK3BCM secured central accommodation at the Anton Huette Lodge and we were able to proceed in a safe, comfortable environment. In all, 14 amateurs plus Nan (VK3CAT's XYL) and Chantel (VK3KIM's daughter) attended.

Friday was quiet as the expected weather event came across bringing rain and plenty of wind. Interstate activators were safety at Hotham and locals were drying equipment, leaving those still travelling managing to activate a few summits between showers:

- VK2IO: VK3/VE-165
- VK2HRX: VK3/VG-030 and VK3/VG-045
- VK1DA: VK3/VE-105 and VK3/VE-126
- VK3CAT: VK3/VE-019, VK3/VE-014 and VK3/VE-039
- VK3ARH: VK3/VE-230
- VK3YY: VK3/VG-049 and VK3/VG-045

The rain and wind cleared by Saturday morning allowing a full day for several groups to work the summits. Ken VK3KIM travelled up from Melbourne to join in the fun, meeting up with Leigh VK3SG, Brian VK3BCM, Phil VK3BHR, and John VK5HAA.

The tracks were slippery and there were trees down, leading to the cancellation of at least one loop. The weather also resulted in cancelling of the planned evening activation of Mt Hotham (moved to Sunday). As a result, a late evening was had by several groups, though all made it back safely to enjoy tea at the pub. Overall, 13 activators activated 15 summits with some doubling up because of the weather:

- VK2IO, VK3PF and VK3EQ: VE-023, VG-030 and VG-064
- VK1DA and VK2HRX: VE-070 and VE-080
- VK3BCM and VK3SG: VG-045, VG-049, VG-157 and VG-027
- VK3BHR and VK5HAA: VG-045, VG-049, VG-157, VG-026 and VG-027
- VK3KIM: VG-036, VG-049, VG-027, VG-157, VG-026 and VG-027
- VK3CAT, VK3ARH and VK3YY: VE-024, VE-021, VE-015 and VE-039

Sunday was another day of summits. After exchanging notes from the day before, and modifying plans, groups set out again seeing 14 summits activated by 13 activators. Andrew VK1DA was out early with 23cm to activate Mt Hotham. This was a success, with 38 contacts across several bands (see below). VK3ARH and VK3YY planned to walk out to Mt Tabletop, but cancelled as the track had become a creek forcing them off track and leading them to doubt that they would make it back for Hotham that evening (30 minutes to cover only 300 metres!):

- VK2IO, VK3PF and VK3EQ: VG-022, VG-009, VG-008 and VE-006
- VK1DA: VE-006, VE-024 and VE-021
- VK3BCM, VK3SG, VK3KIM, VK3BHR, VK5HAA and VK2HRX: VE-021, VT-018, VT-033, VT-020, VG-015 and VE-006
- VK3CAT: VE-005 and VE-006
- VK3ARH and VK3YY: VE-005 and VE-006

Photo 2: Ken VK3[illegible] Hotham with Mt Buffalo in the background.

Photo 3: VK3CAT working EU from Mt Hotham using his magnetic loop antenna.

The advantage of these events is the concentration of activators within VHF range; so, most summits qualified on 2m. However, chasers were not neglected with HF stations set up and, while propagation was pretty tough on 40m and 80m, 20m was the go-to band, allowing VK and ZL contacts.

From Hotham on Sunday evening, VK3CAT and VK2IO worked into Europe, South Asia, ZL and VK6 with the KX3 and magnetic loop, while Phil, VK3BHR chased contacts on 80m and Allen, VK3ARH worked VK6 and ZL using FT8, with 20m being the go-to band. Typical alpine weather with late cloud and fog came over, causing us to retreat to the pub.

Andrew, VK1DA had a successful morning with 23cm from Mt Hotham:

Having recently bought a 25 W amplifier for 1296 to go with my SG-LAB transverter, several days before leaving home I set up and tested the amplifier DC cable, PTT line and coax interconnections to be able to use it at Mt Hotham. It all went together like Lego and worked perfectly.

The transverter, amplifier, cables and the 4-element antenna all went into a plastic food container and were added to my back pack for the climb up the hill.

Onsite on Sunday morning, I set up the 23cm 4-element beam on the camera tripod and connected the 2m rig to the single element loop antenna as popularised (and built) by Andrew Moseley, VK1AD. The 2m rig was a Kenwood TR-751 and its 25 W was ideal for liaison work. It requires only 400 mA of current on receive, roughly the same as the FT-817.

Andrew, VK1AD was at Mt Ginini, ACT, VK1/AC-008 and was already on the air when I turned the gear on. On 2m his signal was S3-7 with lots of path variation due I think to the morning air warming up. Al, VK1RX was on Mt Ainslie VK1/AC-040 on 2m and 23cm. Contacts were logged with VK1AD on 2m and 23 cm and with VK1RX on 2m.

Chris, VK1DO was also on the air from his home station and big antennas. Chris was worked on 2m SSB, a marginal contact but he was impressed by the effectiveness of the little loop antenna.

Andrew, VK3JBL was at Conner's Plain VK3/VT-022 and was received at massive levels on 2m and a good strong signal on 23cm.

Also Jim, VK1AT/3 was further south in the Gippsland Lakes area and was worked on 2m and 23cm. Following the longer distance contacts, more were made on 23cm using SSB, CW and FM, with the group at Mt Pendergast (VK3PF, VK2IO and VK3EQ), then also with the group at Mt Blue Rag, (VK2HRX, VK5HAA, VK3SG, VK3BHR and VK3BCM), who were all using Compton's 23cm HT with a PCB antenna. For some operators, these were their first contacts on that band.

All in all, some good fun with VHF/UHF.

Andrew, VK1DA

Monday was another busy day with summits with groups heading out for more loops and other activations on the way home:

- VK3CAT: VG-016and VG-003
- VK2IO and VK3PF: VE-021, VE-015, VE-039 and VE-005
- VK1DA and VK5HAA: VE-015, VE-039 and VE-005
- VK2HRX: VE-081, VE-256 and VE-126
- VK3YY and VK3ARH: VE-017
- VK3BHR: VE-014 and VE-019
- VK3KIM: VE-005

Gerard VK2IO and John VK5HAA stayed on to pick up additional summits, then headed back. We can report all activators made it home safety. Interstate players were back in their home states before the snap border shutdown. While there were challenges with equipment, all reported uneventful journeys.

It was another fantastic weekend. We were very lucky with the weather and band conditions were not that bad overall. It was great to meet and activate with fellow SOTA enthusiasts who have been regular contacts over the last few years.

Thanks to Brian, VK3BCM for arranging the accommodation and making all the associated arrangements. Thanks again to Brian, VK3BCM and Peter, VK3PF for sharing all their local knowledge and advice on "how to get to where" for successful activations / chases and finally to everyone who participated and contributed - activating, chasing, driving, navigating, putting HF on the air, etc.

Looking forward to the 6th annual Mt Hotham SOTA Summit in 2022.

New parks for VK6

VK6 gained 53 new WWFF sites. Thanks to Han,VK6XN and Marc, VK3OHM for the work they did to prepare the sites. Parks'n'Peaks has been updated and includes boundary files as well as SOTA summit opportunities in the new parks.

Coming up: KRMNPA 10-11 April 2021

TBA: SOTA and Parks in Grampians October 2021. Plans are afoot for a SOTA and Park event based around the Grampians National Park (Gariwerd). This will be an event for SOTA and Park activators alike, with 60 summits and 20 odd parks within 60 km. More details will appear as plans are verified. So, stay tuned. (*https://parksnpeaks.org/getClose.php?myLat=-37.2932&myLong=142.6009&myDist=60*)

73 and 44,

Allen, VK3ARH

Photo 4: The welcome reward! Left to right: VK3ARH, VK3PF, VK3AGS, Nan,VK3EQ, VK2IO, VK1DA, VK2HRX, VK3SG, VK3BCM.

Participate

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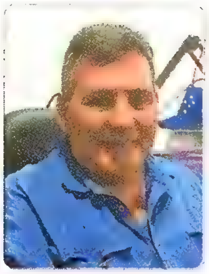


DX Talk

Steve Barr VK3KTT
e *vk3ktt@gmail.com*

Well, DXing hasn't been inspiring or exciting these past few months due to the lack of DXpeditions within 'easy reach' and very few planned for the future with travel limited by COVID restrictions.

While there has been plenty of activity around, most of it is in Europe or the US. On the air, FT8 has become the default mode for most, myself included. You can be rewarded if you venture to use SSB voice, or even CW. VK is still considered DX by most of Europe and the US! It seems we (VKs) are what people are hunting.

If you have been on the 30m band with FT8 and heard the pile-ups of JAs or Europeans – and you don't need to be running a mega-station to do this – there are lots of people at home around the world doing the same as us. SSB can be rewarding, even at 100 watts.

Just to keep my hand in, I will work some DX barefoot and on a random wire. It takes some skill and the right audio but these are the skills we should be honing while things are quiet. The other thing is, if you know CW or have your call and a 599 TU programed for your radio and a decoder running, try working on your CW DXCC; VK on CW is quite rare.

Do you log contacts and have you joined eQSL or LoTW, or even qrz.com awards, especially if you're using FT8, try to get some form of electronic QSLs happening. If you have a computer log it's quite easy with most of the newer logs to upload to the various log sites, like LoTW or eQSL.

Willis DXpedition

Tommy VK2IR and the Hellenic Amateur radio association of Australia (HARAOA) are planning a DXpedition to Willis Island (VK9-W) over November 3rd to 13th this year. The MV Alfred Wallace is departing from Cairns with DXpeditioners. I am informed that there are still a few slots available if you want to go; contact Tommy VK2IR for more info.

DX news from ARRL

ZAMBIA: Bodo HB9EWU is active as 9J2BG while working on a humanitarian mission in the Luapula Province. He is active in his spare time, generally on 20 metres.

UAE: Greg KD5ESG will be active as A65HH while on work assignment in Abu Dhabi.

ECUADOR: Rick NE8Z is active as HC1MD/2 from Santa Elena Province until 15 May. Activity is on 40m to 6m.

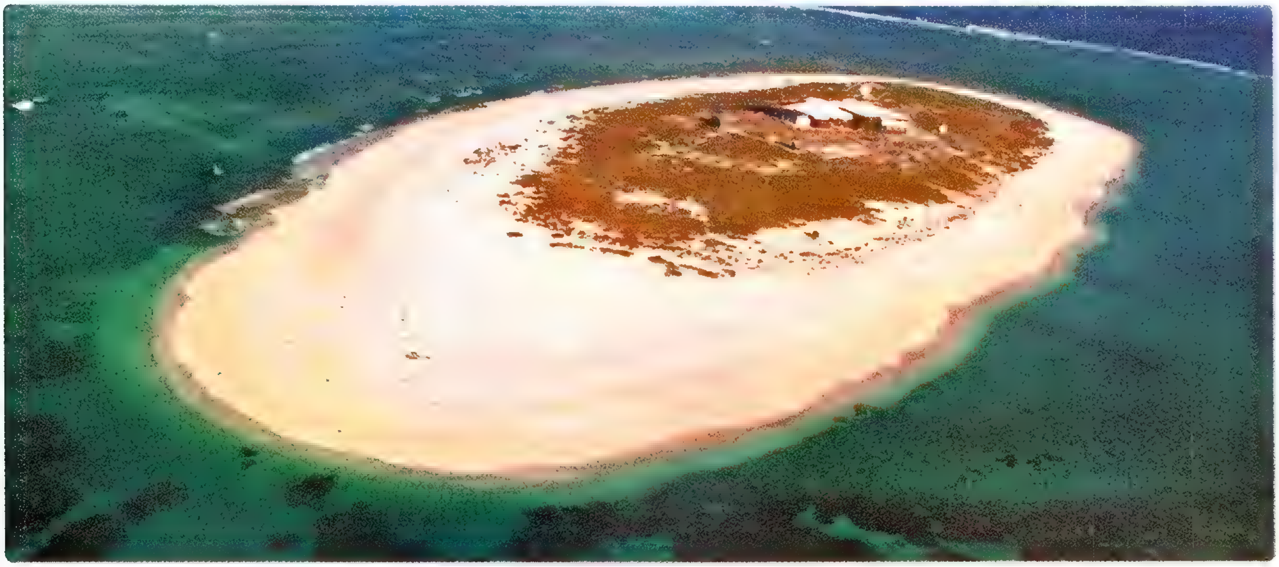
POLAND: Special event stations SN0ZOSP and SN100ZOSP are active until 5 February 2022 to celebrate the 100th anniversary of the Association of the Voluntary Fire Brigades of the Republic of Poland.

BENIN: Ian ZS6JSI is active as ZS6JSI/TY from Parakou until June. Activity is in his spare time on the 80m, 40m and 20m bands, using SSB and FT8.

MARSHALL ISLANDS: Paul KA4WPX is active as V7/KA4WPX and V73AX from Kwajalein Atoll, IOTA OC-028. Activity is at various times on the bands from 160m to 10m, and possibly 6m, using CW and SSB.

ASCENSION ISLAND: Tev TA1HZ is active as ZD8HZ until mid-April.

Willis island in the Coral Sea, east of Cairns in North Queensland, will house the VK2IR DXpedition in November (BoM photo).



ALARA

Jenny Wardrop VK3WQ

Unfortunately, the ALARA column for this issue has turned out to be rather a sad one, *but* I have tried to leave you with a smile on your faces at the end!

ALARAmeet Bendigo cancelled

The first piece of sad news is that the ALARA Committee in conjunction with the ALARAmeet Committee has decided, with regret, that it should cancel ALARAmeet 2021. This meet was a re-badged Bendigo ALARAmeet 2020 that was cancelled because of COVID-19 last year.

At the time of writing, Melbourne is again in lock-down, albeit for only five days (we hope) but it shows once again, the unpredictable nature of the COVID-19 virus and we are told that this time, it's the even more virulent UK strain. Not only do we want to keep everyone safe, but it would be awful if any of the interstate or overseas visitors, suddenly couldn't get home!

The good news is that we have 'pencilled in' the next ALARAmeet for 2023 that will bring us back to our normal three-year cycle and hopefully, by then, the vaccinations will have kicked in and some sort of normality returned to our lives. Where it will be held, has not yet been decided. We hope that you can accept our decision.

Cathy Purdue ZL2ADK SK

Many of you who have attended some of our past ALARAmeets will probably remember Cathy ZL2ADK and her OM Brian ZL2ADL. I first sponsored Cathy into ALARA and she sponsored me into the New Zealand Women Amateur Radio Operators organisation (WARO) in October 1982 - 39 years ago!

Cathy and Brian attended their first ALARAmeet in Perth in 1996, the only one I haven't attended, but we did finally meet face to face in Brisbane in 1999. She and Brian also went to the 2nd Mildura ALARAmeet in 2005, after which I drove them back to Murray Bridge where they stayed with me for a few days. More recently, they attended the Nelson Bay meet in 2014 and Cairns in 2017.

I would like to share some of my memories (with a little help from an old WARO Newsletter) of this amazing woman's activities and achievements.

Born and educated in Wanganui, Cathy went to Palmerston North for her tertiary education to become a teacher. She and Brian raised a family of four plus one foster child; four girls and a boy.

Cathy was first licensed in 1979 as ZL2NAT, and believed that she was the first YL Novice in New Zealand. Not long after that, she passed her Grade 3 exam and became ZL2TZR. In 1980, she passed her Grade 2 Morse, becoming ZL2ADK, and in 1981 the Grade 1 exam.

I will try to précis Cathy's other amateur activities and achievements.

After obtaining her licence, Cathy served for several years on the WARO executive, taking many positions culminating in her becoming President. In 1985 she was elected to the NZART Council where she served for 10 years. After a short break, she did another two years from 1997 to 1999. During this time she was asked to do a WARO segment on the NZART Broadcast each month, and she did this for 10 or 11 years.

Photo 1: Jen VK3WQ and Cathy ZL2ADK, ALARAmeet Brisbane 1999.

She was a member of the Wanganui Land Search and Rescue Organisation for over 20 years (as at 2013) and served for a time as Deputy Section Leader of Amateur Radio Emergency Communications (AREC) for its local Marton Branch 23.

Cathy was part of a group of YLs who first put the WARO callsign ZL2YL on air, for a National Field Day, operating under Branch 19 Inglewood. They were accused of being 'Pirates' several times, but after it was realised that they were genuine, it became a busy and fun weekend.

She was honoured to be made a Life Member of WARO in 1985.

In 1989, Cathy and Brian did their first overseas trip to the Young Ladies Relay League – America (YLRL) Convention in Hawaii. She was part of the committee that arranged the YL International gathering in Wellington in 2000; and later attended a YL International Meet in Sicily.

Cathy will not only be missed by her many friends and relatives, but also by the many organisations to whom she willingly gave her time and energy.

She passed away on 10 February 2021, after a long battle with cardiac problems and cancer.

Post Script: Cathy's funeral was held on Tuesday 16 February, in Palmerston North. I was humbled and pleased to be sent the information to receive the streaming of it on-line.

There were 100 people in the chapel, according to the COVID-19 regulations, and the over-flow of people watched it in the nearby Scout Hall, a recognition by all the people whose lives she had touched.

Our deepest sympathy goes to Brian and the family. Valé dear friend, Cathy ZL2ADK; 15.10.46 – 10.2.21.

YL NETS

As reported in the last Issue, Shirley VK5YL had hoped to hear from

Photo 2: Pam VK3NK, Heidi VK3HID and Jen VK3WQ at the ('very exclusive') Gisborne ALARA Lunch. (note the smoke in the background)

Photo 3: Pam VK3NK explains how the mechanical organ works with its punched paper roll, and the candle through which the occasional puff of smoke is pumped.

anyone (or more than one person) who would be interested in running the DX222YL Net at 0500 UTC on a Monday or Wednesday, on 14.222 MHz. Unfortunately, no-one has volunteered so far, but Shirley would still be happy to hear from any YL who is interested. It would be even better if several YLs volunteered, so that the work-load could be spread.

Shirley also reported that the YL Downunder Net is not now operating. She sent out an email a while back to those who had been semi-regular on the Net, but only got one reply back and that person has health problems at the moment. This Net was only on the 4th Thursday of the month, so if anyone would be interested in taking it on, please contact Shirley at *vicepresident@ALARA.org.au*

VK3 ALARA Lunch at Gisborne

On Saturday 30 January, an ALARA lunch was planned to be held at the QTH of Graeme, VK3NE and Pam, VK3NK in Gisborne. It was to be held under their back-yard gazebo, and we were to bring our own picnic lunches, in line with COVID-19 precautions.

The previous day had been dreadful, weather-wise, with heavy rain and flooding over much of the metropolitan area of Melbourne; I think this may have deterred many people, although, I know that some others were unable to attend because they had health issues.

Only two couples attended: Heidi, VK3HID and OM Mike, VK3AHA, and Peter, VK3RV and I. The weather was sunny and dry, and the six of us spent a very pleasant afternoon, later to be entertained by Graeme and then Pam on their animated, 'Simian (monkey) Paradiso' 20-note mechanical organ that they had designed and built.

Our thanks go to Pam and Graeme for their kind hospitality.

YL Involvement with Parks on the Air, and SOTA (Summits on the Air)

Many of our YLs have been getting involved with 'Parks on the air' and Summits on the Air (SOTA), including our President, Linda VK7QP, and Contest Manager, Sue VK5AYL. It's a great way to get exercise, fresh air, and points towards some of the great Awards offered. What better way to overcome COVID-19 blues, have some fun and work toward an amateur radio goal?

And now, something to make you smile

Middle age is when you choose your cereal for the fibre, and not for the toy. When you fall down, you wonder what else you can do while you're down there.

The Four Stages of Life:

1. You believe in Santa Claus
2. You don't believe in Santa Claus
3. You are Santa Claus
4. You look like Santa Claus.

(With grateful acknowledgement to the WARO Bulletin, August 2014).

AMSAT-VK

AMSAT Co-ordinator
Paul Paradigm VK2TXT
email: ***coordinator@amsat-vk.org***

Group Moderator
Judy Williams VK2TJU
email: ***secretary@amsat-vk.org***

Website:
www.amsat-vk.org

Group site:
group.amsat-vk.org

About AMSAT-VK

AMSAT-VK is a group of Australian amateur radio operators who share a common interest in building, launching and communicating with each other through non-commercial amateur radio satellites. Many of our members also have an interest in other space based communications, including listening to and communicating with the International Space Station, Earth-Moon-Earth (EME), monitoring weather (WX) satellites and other spacecraft. AMSAT-VK is the primary point of contact for those interested in becoming involved in amateur radio satellite operations. If you are interested in learning more about satellite operations or just wish to become a member of AMSAT-Australia, please see our website.

AMSAT-VK monthly net

Australian National Satellite net

The Australian National Satellite Net is held on the second Tuesday of the month (except January) at 8.30 pm eastern, that's either 9.30 or 10.30Z depending on daylight saving. Please note we will be taking check-ins from 8.20pm-ish. Check-in starts 10 minutes prior to the start time. The AMSAT-VK net has been running for many years with the aim of allowing amateur radio operators who are operating or have an interest in working in the satellite mode, to make contact with others in order to share their experiences and to catch up on pertinent news. The format also facilitates other aspects like making 'skeds' and for a general 'off-bird' chat. Operators may join the net via EchoLink by connecting to either the *AMSAT* or *VK3JED* conferences. Past experience has shown that the VK3JED server offers clearer audio. The net is also available via IRLP reflector number 9558. In addition to the EchoLink conference, the net will also be available via RF on the following repeaters and links.

In New South Wales
VK2RBM Blue Mountains repeater on 147.050 MHz

In Queensland
VK4RRC Redcliffe 146.925 MHz -ve offset IRLP node 6404 EchoLink 44666

In South Australia
VK5TRM, Loxton on 147.175 MHz
VK5RSC, Mt Terrible on 439.825 MHz IRLP node 6278,
EchoLink node 399996

In Tasmania
VK7RTV 2 m. Repeater Stowport 146.775 MHz. IRLP 6616

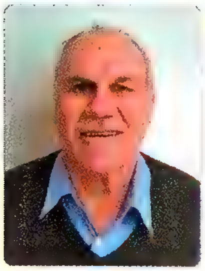
In the Northern Territory
VK8MA, Katherine on 146.750, CTCSS 91.5, IRLP Node 6800

We are keen to have the net carried by other EchoLink or IRLP enabled repeaters and links in order to improve coverage. If you are interested in carrying our net on your system, please contact Paul via email. Frequencies and nodes can change without much notice. Details are put on the AMSAT-VK group site.

Become involved

Amateur satellite operating is one of the most interesting and rewarding modes in our hobby. The birds are relatively easy to access and require very little hardware investment to get started. You can gain access to the FM 'repeaters in the sky' with just a dual band handheld operating on 2 m and 70 cm. These easy-to-use and popular FM satellites will give hams national communications and handheld access into New Zealand at various times through the day and night. Currently only SO-50 is available.

Should you wish to join AMSAT-VK, details are available on the web site or sign-up at our group site as above. Membership is free and you will be made very welcome.



WIA Awards

Marc Hillman VK3OHM/VK3IP

Below are listed all New awards issued from from 2021-01-08 to 2021-02-14

Go to *http://www.wia.org.au/members/wiadxawards/about/* to use the online award system.

The WIA DX Awards program is pleased to announce a new annual Leaderboard competition for Standard licensees, starting 2021. Previously, Standard and Advanced licensees were combined in a single Leaderboard. Now, Standards have their own section.

Overall winners in both Foundation and Standard sections each year, based on highest score, will receive a complimentary crystal plaque courtesy of our Sponsor, Future Systems.

New awards

Antarctic

#	Call	Name	Mode
123	DJ6TF	Thomas Freimann	Open
124	K0BBC	Matt Holden	Open
125	K0BBC	Matt Holden	Digital

DXCC Multi-band (3)

#	Call	Name	Mode	Band	Count
194	VK6EH	Wayne Johnson	Open	40-20-15m	389

DXCC Multi-band (5)

#	Call	Name	Mode	Band	Count
139	VK6APK	Aleksandar Petkovic	Digital	40-30-20-17-15m	592
140	VK3MB	Philip White	Open	40-30-20-17-15m	631

DXCC Multi-band (7)

#	Call	Name	Mode	Band	Count
65	VK3BDX	David Burden	Digital	80-40-30-20-17-15-12m	1364
66	VK2BY	Bradley Devon	Open	80-40-30-20-17-15-12m	1025
67	VK2BY	Bradley Devon	Digital	80-40-30-20-17-15-12m	948

C Multi-band (9)

Call	Name	Mode	Band	Count
IU0LFQ	Alessio Bravi	Open	160-80-40-30-20-17-15-12-10m	1376
K0BBC	Matt Holden	Open	160-80-40-30-20-17-15-12-10m	1851

DXCC Multi-mode (CW)

#	Call	Name	Count
275	DJ6TF	Thomas Freimann	322

DXCC Multi-mode (Digital)

#	Call	Name	Count
130	K0BBC	Matt Holden	249

DXCC Multi-mode (Open)

#	Call	Name	Count
511	K0BBC	Matt Holden	308
512	DM1HR	Hans-Rainer Langner	150

DXCC Multi-mode (Phone)

#	Call	Name	Count
642	K0BBC	Matt Holden	297

DXCC Single-band

#	Call	Name	Mode	Band	Count
840	VK3BDX	David Burden	Digital	12m	101
841	VK6APK	Aleksandar Petkovic	Digital	40m	104
842	VK3TX	Oscar Reyes	Open	20m	102
843	VK3TX	Oscar Reyes	Digital	20m	102
844	VK2BY	Bradley Devon	Open	80m	102
845	VK6SJ	Stephen Kennedy	Digital	20m	103
846	VK6SJ	Stephen Kennedy	Digital	15m	100
847	IU0LFQ	Alessio Bravi	Open	160m	100
848	VK2BY	Bradley Devon	Digital	80m	100
849	VK6EH	Wayne Johnson	Open	40m	109
850	VK6EH	Wayne Johnson	Open	20m	168
851	VK6EH	Wayne Johnson	Open	15m	116
852	VK6EH	Wayne Johnson	Phone	20m	155
853	VK6EH	Wayne Johnson	Phone	15m	100
854	VK3MB	Philip White	Open	15m	100
855	VK3MB	Philip White	Digital	30m	104

Grid Square

#	Call	Name	Mode	Band	Count
535	DM1HR	Hans-Rainer Langner	Open	HF	830
536	K0BBC	Matt Holden	Open	HF	1526
537	VK3KTT	Steven Barr	Digital	6m	55
538	VK2PKT	Keith Turk	Open	HF	300
539	VK2PKT	Keith Turk	Digital	HF	300

Oceania

#	Call	Name	Count
54	DJ6TF	Thomas Freimann	55
55	VK1MES	Malcolm Stephens	25
56	K0BBC	Matt Holden	53

Worked All VK Call Areas HF

#	Call	Name	Mode
2421	OZ1IKY	Kenneth Hemstedt	Open
2422	DJ6TF	Thomas Freimann	Open
2423	K0BBC	Matt Holden	Open

VK6news

January's Peel Amateur Radio Group (PARG) TechTalk was another cracker. We were honoured to have Zoom videoconference presentations by Paul Simmonds, VK5PAS on the VK Flora & Fauna Parks program and by Sue Southcott VK5AYL on her terrific iParksnPeaks app.

The hard work by both of these South Aussies is appreciated by so many radio amateurs who've found themselves addicted to portable operations. We'll have a session from Peter VK3ZPF on his Android-based VK Port-a-Log Application soon.

The January Zoom presentations were followed by a demonstration of Morse keys and keyers by Tony Boddy VK6DQ.The Group has been promoting portable and low-power ops, and has started encouraging members to learn or re-learn the art of CW. We're looking forward to Tony's CW practice sessions on 146.5 MHz FM soon, and to the 80m Slow CW Contest. The inaugural Contest was held on 20 February; we'll report on the sore wrists, sore ears and huge grins next time.

In the meantime, several members have been using phone apps including Morse Mania and Claus' Morse Trainer to learn or brush up their CW. And some of our members who hadn't used the mode in anger in years - or at all - have even been heard on air, practising contest-type exchanges in preparation.

Our second regular portable parks field day was held on Sunday 7 February. Rather than the usual 40+ degree weather for that time of year, the skies opened and it bucketed down. Only Geoff VK6GHD, John VK6FAAJ, and David VK6FAAZ dared to venture out in the gale with cold horizontal rain.

Our intrepid Naval man wore his best white shorts – and froze; the two other ex-Army types were somewhat better prepared with heavy jackets, and our Air Force representative operated from the comfort of his cozy shack in NSW. Still, using QRP from the Len Howard Conservation Park, the team managed to work VK2, VK3, VK4, VK5 and VK6.

We're all looking forward to milder conditions for the next field day in March, when the Group will head down to the Leeuwin-Naturaliste lighthouses for the John Moyle Memorial Field Day.

By the time you read this, the Annual PARG Swap Meet on 6 March will be done and dusted; we'll report next time. Keith VK6QA offered a terrific donation in support of PARG's efforts to promote Amateur Radio and provide emergency support in the Peel region. On behalf of the Group, a huge thank you to Keith for your very generous offer.

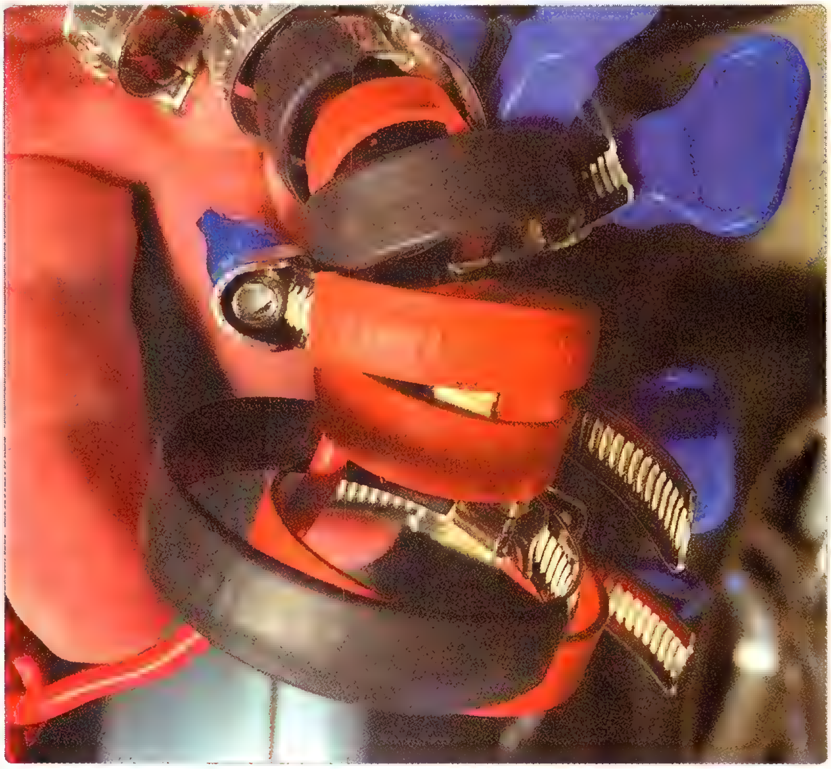
Led by Maurice VK6HLY and Terry VK6TTF, several members have either bought or built noise cancellers to help deal with switch-mode power supply hash on the lower HF bands. Maurice and Terry have been experimenting with using small active antennas, such as the PA0RDT MiniWhip for the noise pick-up and have found the design to work very well indoors.

Several member of the Group have bought squid poles for portable HF antennas, and at least one has already broken his. Geoff VK6GHD uses nicely heat-shrunk hose clamps to stop his squid poles collapsing.

PARG meetings are now at 1900 WA time on Tuesdays – see *www.parg.org.au* for details, or email *parg_secretary@iinet.net.au* for more information.

Geoff Hart-Davies VK6GHD
Mark Bosma VK6QI, VK2KI

VK6GHD's solution to collapsing squid poles



Northern Corridor Radio Group

The club and its members have been much more active on-air over the past couple of months, with six members of the club currently competing in the WIA DX Leader board (and four in the top 10!). Of note is Brian VK6MIT leading the Standard licence category as well as holding a very respectable 7th place overall.

Our remote station has been down because of issues with the SteppIR, but should be back on air by the time you read this.

Ten members of the club are travelling to Cocos-Keeling Islands on a DXpedition as VK9CE. They will arrive on the 16 March, departing on 23 March. Two stations will be on-air on all bands from 80-10m on SSB, CW and FT8.

Flights are booked and paid for, accommodation booked and equipment is mostly ready to ship. More details can be found on QRZ.com. We will be on the island for the John Moyle Memorial Field Day, although only time will tell if the pile ups will allow us to participate in the contest.

Our EME station is closer to realisation with the lease for additional land adjacent to the current lease at Whiteman Park now signed. The building was scheduled to be shifted to its final position in mid-February.

Our club repeater VK6RNC is now fully operational. Range is significantly increased from the old KL Repeater and homebrew diplexer. We are using a Sydney-manufactured RF Technology Eclipse 2 repeater transceiver and an EMR-Manufactured Diplexer.

The repeater is connected to a controller that provides our current voice ID (instead of CW) and also has an Allstar node imbedded. The repeater is remotely accessible, allowing us to monitor and configure it. It also has P25 capability. We are considering using CTCSS, but this (robust) discussion is ongoing.

Ham College activity

Ham College remains very active, with the first Foundation course and exams completed in February. This year's Standard and Advanced courses have been scheduled to begin on 16 March. This year we have around ten instructors; so, the college is most likely healthier than it has ever been.

Our course last year produced five new Standard and Advanced licence holders, of whom two have since joined the college and are getting involved in the delivery of the Advanced and Standard courses. We are still taking candidates for this course.

Last December we had our annual dinner and at which we presented Kathi VK6KTS with a life-membership plaque. We also presented Neil VK6BDO (now SK) with the same membership and plaque that was accepted by his family shortly before his passing. Kathi and Neil were both founding members of Ham College.

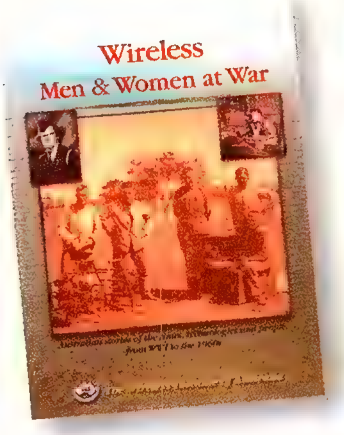
Both have been involved continuously with Ham College as instructors and assessors. Neil co-wrote the manual we use at the college for the Advanced and Standard courses and taught the courses singlehandedly for many years before retiring in 2017.

We received a very generous donation of a Kenwood TS2000 transceiver from Steve VK6ACO over the Christmas holiday period. This has enhanced our practical training kit significantly, and also gives the college a 1.2 GHz capability.

Chris VK6CF and Greg, VK6LH have been working on refurbishing and relocating the 2m beacon that used to be maintained by Ham College. It was at Wireless Hill but will now be located at Ham College. Greg has built an application to provide the WAV files to the new transmitter and Chris will set it up. We hope this will be up and running sometime before the end of June.

The beacon broadcasts both the WIA and NewsWest news as well as information of local amateur radio clubs and the RAOTC news. The repeater will transit at 5 W into a vertical antenna around 10 metres off the ground.

The college welcomes back one of the original founders, Clare VK6CCL, who is looking to join our instructor team and has also volunteered to give the course manual an overhaul. Clare co-wrote the manual with Neil.



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Silent Key

John Bishop VK2ZOI

It is with great sadness that we share the news that John Bishop VK2ZOI (VK2BK), long-time President of Hornsby and Districts Amateur Radio Club (HADARC), became a silent key in the early hours of Friday, 29 January 2021.

John sadly lost his battle with metastatic melanoma that was only diagnosed in early December 2020. While suffering through his medical treatment, John withdrew from regular radio operations, although he was able to concentrate on both HADARC matters and the transition of stewardship.

In his final days, he recalled fond memories of family and friends, and in his final over, John spoke of the radio club that was such an important part of his life. John was particularly proud of the teamwork club members displayed at the very successful Wireless Centenary event held just outside Sir Earnest Fisk's home in Wahroonga on 22 September 2018.

John was in his 50th year as an Amateur Radio Operator, and joined the Wireless Institute, NSW Division on 27 July 1962, 58 years ago. While only 75 years of age, he may have been an OM but was definitely not an old man.

John began his working life as a young 17-year-old trainee at Amalgamated Wireless Valve Co, North Ryde, in Jan 1963 in the "Semiconductor Section" where he qualified as a technician. He later became a Technical Officer in the "Receiving Valve Section". John eventually gained a degree in Electrical Engineering and worked in the specialist area of the "Power Valve and Special (CV) Valve Section". John was astute enough to see the writing on the wall for AWV and left in August 1975.

John VK2ZOI on the right, with Dot VK2DB on the left. The infamous "Flowerpot Antenna" can be found online, described in detail, at: https://vk2zoi.com/articles/half-wave-flower-pot/

He then moved on to the Department of Defence where he held various positions – Chief Armament, Superintendent Navy Armament Engineering (Naval Support Command), Regional Director Defence Quality Assurance (NSW), and finally, before retirement, Regional Director Defence Acquisition Office Sydney. It was during this time John began a lifelong friendship with Tony VK2BTL.

John has also been actively involved in Hornsby Seniors. He became the Public Officer for Hornsby Seniors and was their go-to-guy when it came to anything involving technology for the group.

Back in 1977, John was involved with establishing training and education courses for those interested in becoming amateur radio operators. As this early intake of students was quite large, John was also among our early trainers. He even encouraged his wife, Dot, to sit for and successfully obtain her Novice licence. John was also instrumental a few years later in getting three of his sons into amateur radio – Ben and Roger – via the Foundation licence, and Peter via the Advanced licence.

John remained in the training role into the mid-80s and then continued his activities on the HADARC committee, ultimately being appointed HADARC's President. John held the position of President very close to his heart throughout his entire presidency, something that can be clearly seen with some of his last words concerning the club.

Over the last 30 years as President, John has stamped his vision on HADARC, which has both been stable and very involved with all aspects of Amateur Radio. One of the other reasons John enjoyed being President was that he was able to continue to use the managerial skills that he developed during his working life in dealing with various official bodies (Hornsby Council being just one of many examples, hi-hi!)

John was definitely one of a kind. Apart from being an extremely keen amateur radio operator that participated in numerous radio nets during the week, he also participated in nearly every HADARC net, including running his share of nets and encouraging club members to participate in nets online via Jitsi. His large boots will be very hard to fill, and his absence leaves a hole in all our hearts.

John leaves behind his loving YL, Dot VK2DB, who he married on Boxing Day 1966, as well as four sons, many grandchildren, and a legacy of many home-built Flowerpot antennas, not only in Australia but around the world.

A funeral for John was held on the 12 February at Macquarie Park Cemetery and Crematorium, followed by a wake at the Asquith Bowling Club.

Vale John Bishop, VK2ZOI / VK2BK
(12 Oct 1945 – 29 Jan 2021)

Rod Gamble – VK2DAY
Acting President, HADARC

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Call Ewen, VK3OW on 0418 309 911

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HF linear amp KL-505, by RM Italy. The transistors appear to be US, otherwise all OK. It is a broadband amp 3-30 MHz, 10 watts in 300 watts out; from 13.8 Vdc supply.

VK4FV QTHR; also by phone (preferably) or 0448 985 537, or email *vk4dv1@gmail.com*

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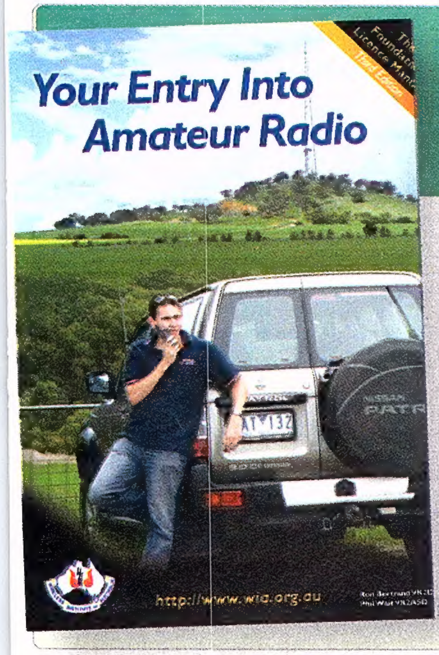
Or email *vk4dv1@gmail.com*



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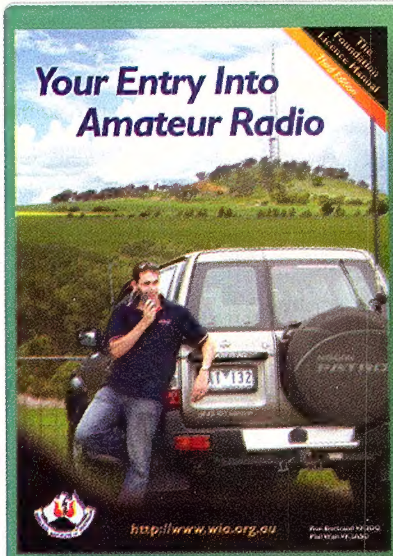

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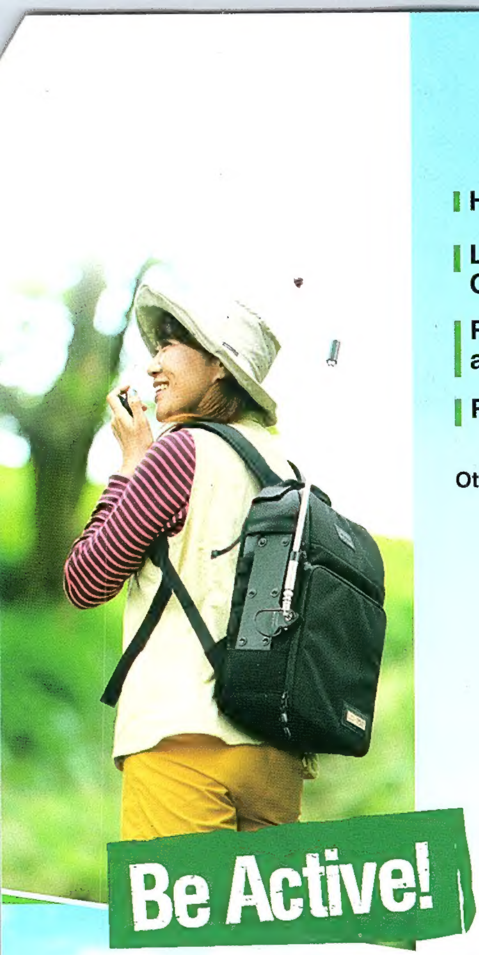

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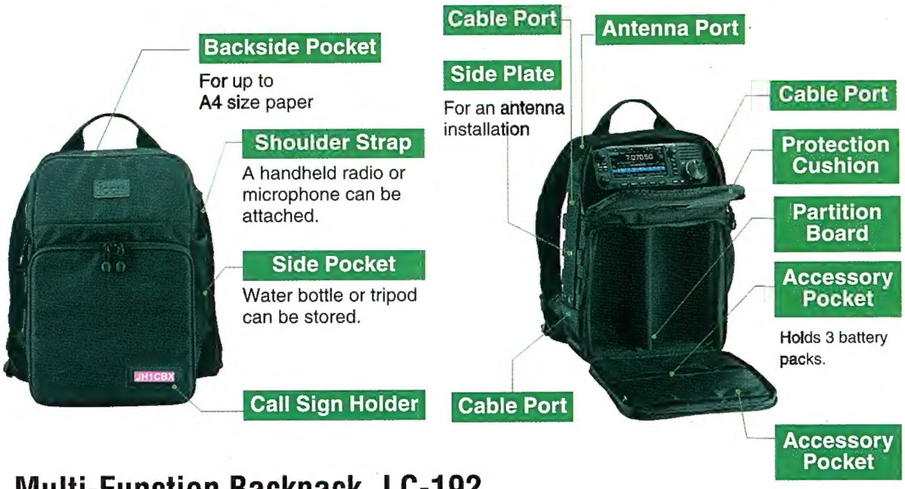

Multi-Function Backpack, LC-192

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